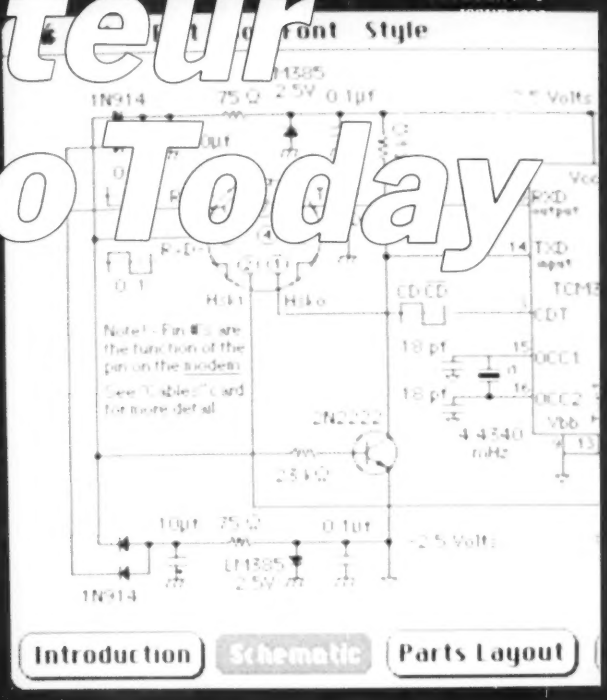
73 Amateur Radio Today

OCTOBER 1992



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LETTERS

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From the Hamshack

Paul Blankenship, Stinnett TX I've just read through my first issue of your magazine. I particularly enjoyed the "Propagation" and "Random Output" sections. However, why not have a department geared to the beginner? Most of the articles are too technical for the neophyte ham. I read the articles anyway, gleaning any information I can make use of, but I sure would like to understand the rest of it, too.

At this point I am unable to become an amateur radio operator and satisfy my thirst to make friends around the country and the world. The major expense of equipment has prohibited me from purchasing even used equipment that would broadcast past the end of the street. So, I guess I'll have to be content with listening to my shortwave receiver for the time being.

I have for years enjoyed scanning, shortwave listening and CBs. I still like to spend evenings talking to friends on my CB radio, but lately I have found this form to be too limiting. I would love to move up to ham radio if I could learn enough about it to warrant the massive expense.

Paul—We have a whole magazine devoted to newcomers. It's called Radio Fun, *and you can call 1-800-257-2346 to subscribe.*

Keep those back issues of 73 *and re-read them every six months or so. You'll be surprised at how much more you'll get out of them.*

I don't understand why you are "unable to become an amateur radio operator." All it takes is a study guide and a few weeks of work. Or, find a local club that's running a licensing class.

The "massive expense" of ham radio is a myth. You've already got a receiver, so pick up a used transmitter or build one. Put up a dipole and you're on the air. The total cost should be less than $100 . . . David N1GPH

Lester Earnshaw KB7FA, Sedona AZ I've received your letter pleading that I renew my subscription to *73*, that the ham industry is down to less than 25% of what it was 25 years ago and needs my subscription to revitalize it. I've also followed your editorialized commendable attempts to do something about the fall-off, and, for the most part, I agree with your various proposals to counter the problem. It's unfortunate, though, that you haven't shown like zeal in the publication of *73*'s technical articles. There was a time, years ago, when *73* was up with the state of the art, but now, alas, all we get are warmed over articles on antennas, on antennas, on antennas, or reviews of Japanese rice boxes.

Where, I ask, are the primers on microprocessors and the programming of them? On direct RF synthesis? On digitalized RF processing?

I submit that it's going to take more than harping on about the elimination of CW as a licensing requirement to draw young people to the fold—I do agree with you that CW should be relegated to its rightful place alongside the other modes, AM, FM, SSB, RTTY—but it's going to take the attractions that first brought people from spark to AM, to FM, to SSB: beginning articles, articles to get people started, articles on the basic programming of basic microprocessors, and follow-up articles. Forget about three-transistor 40 meter CW receivers; they don't have the stability to mix it in with today's transceivers, and besides, why would a kid, grown up with a Walkman glued to his ears, want to build a set of such simplicity, any more than I, in my youth, wanted to build resistors and capacitors once they became readily available?

Have you forgotten, Wayne, the old adage that man does not live by bread alone? Please, get some new stuff in there so that those with the zeal, and not necessarily a college education, can find out what's going on and keep up with it. Never mind articles on hashed-over antennas and CW keyers for the gas bags and the old farts like you and me; we're dying out anyway. Concentrate on the kids. Challenge them with the state of the art. They'll surprise you.

I enclose my subscription anyhow.

Stay tuned, direct digital RF synthesis projects are coming soon . . .Bill WB8ELK

Rodman Sharp N5NM, Santa Fe NM The rantings and ravings in your "Never Say Die" column are always my first read when *73* arrives in the mail. Over the years they've been the most delightful, aggravating, inspirational, infuriating and motivating stream of unrelenting genius of anything I read.

As one of the newly arrived Neanderthals in CW land, I want to thank you especially for the marvelous job you're doing trashing CW and doing everything you can to bury it. I hadn't used CW for a long time, but you piqued my curiosity to go way down band and see what's going on there, if anything.

As an Extra, I began prowling the lower 25 kHz of 20 meters and (I can hardly believe this) find it almost interference-free if I use narrowband filters. All I have is a trap vertical (antenna restrictions) so SSB on 20 meters, even with my big amplifier, is a real struggle to be heard, especially on weekends.

But amazingly, if I can hear them I can work them on 20 meters CW with 100 watts or less. My second rig is an Argonaut 505 and I began switching over to that after starting a QSO and find that about half the time I can sustain the contact with FIVE WATTS! Even the General class CW sector between 14025 and 14050 is surprisingly uncrowded most of the time.

It's not all brass pounders and bug ticklers down there in the lower 50 kHz of the 20m band, either. I find a lot of really bright hams running CW with computers, using keyboard entry at 25 to 50 wpm with automatic encoding and decoding to their CRT display. The NET-REAL-DATA rate is maybe three to 10 times higher on CW than the redundant and repetitious blah-blah QSOs on SSB. The CW sign-off "chow time Rod 73 and CUL" often requires 100 words plus on SSB.

Another discovery: lots of bright and enjoyable DX hams on regularly who love this keyboard CW stuff and many others who can hack 30 wpm and more on their end with keyers and ear-only decoding. Many have told me they're more comfortable using English as a second language on CW than on SSB, especially trying to UNDERSTAND all those strange American accents on SSB, which just don't seem to be there at all on CW. These folks DON'T KNOW CW is DEAD!

My URGENT PLEA to you, Wayne: Please keep up the good work by doing EVERYTHING you can to DISCOURAGE American hams from having anything to do with CW. That way, we'll keep the CW-only band sectors, even on 20 meters, as delightfully free of crowding, interference and pathological ham behavior as they now are.

Noted . . . Wayne

Art Stamler, Carrollton AL I've just returned from Guatemala, which has to be one of the world's poorer countries. There I was asked by an American retiree who works with emergency medical, fire and ambulance services if I knew of any source of used radio equipment that might be donated to these volunteer groups who have almost no means of communication in the event of disasters. And Guatemala has its share of disasters, from fire to earthquake to vehicular mayhem, and more.

What he asked for was: 1) person-to-person handhelds, mobile units for vehicle use, and base stations, and 2) whip antennas for the above, wherever possible. All units should be in good working order and, hopefully, have circuit manuals. Old tube transceivers are acceptable, as are 23- and 40-channel CBs.

There's a tax break possible for donors, for the value of the equipment donated plus the cost of packing and shipping. Send the equipment to me, care of "Partners of the Americas," P.O. Box 489, Carrollton AL 35447. I'll see that it gets to Guatemala. Many thanks for your generosity. I'll send receipts by return mail, with a tax ID number.

Robert Beeman K4NZL, Roswell GA Your "Never Say Die" column in the August 1992 issue of *73 Magazine* struck a responsive chord with me. Being unemployed at the moment, I have had a lot of time to reflect on exactly why I am in this situation. Mine is not exactly like others in that my job termination resulted from my declining a relocation due to a corporate reorganization.

Many times, the reason for someone being unemployed is that the recession, or foreign competition, has caused the reorganization or "downsizing" of a company. In most cases this is true, but for some reason an awful lot of people seem to blame the current political administration for their problems. My contention is the same as yours. We are the architects of our own situations.

Your column makes the point that we should be expecting these disruptions in our jobs and careers. I agree. Your point that personal retraining would alleviate much of the pain is right on the mark.

To me, training and education are personal things. I have always tried to keep my knowledge and technology current by reading *IEEE* and other publications, on one occasion taking the IEEE-recommended Heath microprocessor course. Because of my genuine interest in learning about technical and other things (I have a BSEE and an MBA), I find myself in a position of not just looking for any job, but a job I will enjoy and that will challenge me. It may take awhile but I will find the kind of job I want.

My point is the same as yours. Individually, we can prosper if we prepare ourselves and are willing to be mobile in the pursuit of opportunities. Our ancestors were not dummies; they were willing to be mobile to find opportunity. Education and physical mobility will become critical in our economy.

The current recession is not the same as we studied in economic texts. This one is caused not only by a lack of domestic demand; it is also driven by our relative inability to compete in international markets. Textbooks and common sense tell us that our national standard of living must fall to the level of other countries for the U.S.A. to compete. This irresistible economic force is now being felt in almost all corners of our economy, and the recession may have a much longer life than we want to think about.

Manufacturing companies in the U.S.A. have been feeling this pressure for a long time. The disruptions in the U.S. auto industry merely underline the seriousness of the situation. However, we can take hope from the fact that some U.S. manufacturers are competing well internationally. Witness companies like Motorola, with the recent announcement of its cellular telephone marketing venture in Japan. All is not lost.

Some segments of our economy compete well in global markets, and some do not. Corporations and individuals must recognize that the world will not buy poor quality, expensive goods produced by organizations and individuals with short-term, featherbedding and protectionist mentalities.

If we as a nation do not implement reforms, the world markets will force us to. Either way, I will prosper because I am prepared.

I enjoy your column as much as the articles in *73 Magazine*. Thanks for your concise opinions in this season of so much political smoke. 73

73 Amateur Radio Today

October 1992
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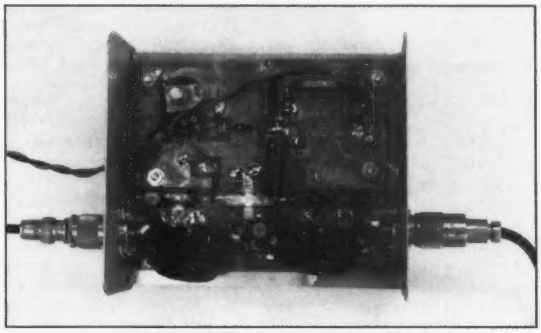
TABLE OF CONTENTS

FEATURES



Give your HT a boost . . . see page 20.

REVIEWS

Cover: Easy packet for the Mac. A simple circuit and some software is all it takes. See page 8. Photo by David Cassidy N1GPH.

DEPARTMENTS

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It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

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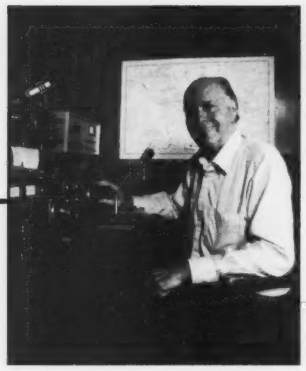
Contract: The mere possession of this magazine constitutes a binding contract between you and The Team at *73* to spend at least 10% of your operating time working Novices and Techs and making amateur radio more fun for them. No excuses will be tolerated.

NEVER SAY DIE

Wayne Green W2NSD/1



ARRL Guts Packet!

Packet radio, just about the only contribution to technology from amateurs in the last 20 years, has been perceived as a constant threat by the League, so their recent action to virtually end packet operation and experimenting did not surprise many members.

The League was founded as a Morse code message relaying organization back in the days when radio distances on the long wave bands were limited. This evolved into the ARRL National Traffic System (NTS), which has relayed (or lost) millions of inconsequential messages for several generations.

The first serious threat to the NTS came in the early 1950s when RTTY was pioneered, allowing the automatic error-free relaying of messages at about six times the speed of Morse nets. For years the League vigorously opposed any expansion of RTTY beyond 2m . . . a battle that I was intimately involved with and which first brought me up against the clique that was actually running amateur radio . . . for their own profit. That's when I found myself opposed by the smugly arrogant League general manager. This was the same chap the amateurs at the ITU complained about, telling me that they'd had to throw him out of ITU meetings in Geneva because he was drunk and bringing prostitutes to the meetings. Ah, the things our membership dues went for in those days.

Now, is Green bad-fingering the League again? Well, I'm telling the facts as I knew them at the time—nothing that I haven't written before. And I'm only bad-writing the League if you happen to have a prejudice against alcoholics or bimbos, in which case, if you're a Democrat, you are already pre-disturbed. Oh yes, I suppose I might also be inciting CW über alles fundamentalists to a danger of strokes. I'm just telling it like it was.

So what's the latest Newington attack on packet? Well, at the July board meeting they decided to recommend that the FCC ban unattended HF packet operation. As a result the packeteers are screaming like stuck pigs. They're furious with the directors. They're angry with the HQ staff who they claim appointed the ARRL Digital Committee mainly to be the executioners of packet.

In truth, if the FCC does go along with the ARRL's recommendation, that will be the practical end of packet radio, so I can understand the outrage expressed by packeteers. But I think they should give some consideration to the other side of the situation. If packet radio were allowed to continue to develop and grow, providing ever faster automatic message handling, that could well be the end of CW's use for message handling. I think you should keep in mind that packet is primarily a mode being used by younger hams, while CW is used largely by us crusty, arrogant old-timers. The ARRL and its directors have always been devoted primarily to the interests of older hams . . . the same as you find with most ham clubs . . . so this shouldn't be surprising. After all, is there any reason old-timers shouldn't run this crummy hobby the way they want it? And the blunt fact is that most old-timers don't understand packet, with those newfangled computers and all. All you have to do to get an old-timer upset is start trying to explain about packet and his eyes will glaze over and mind snap shut. I know this is true because I'm an old-timer and my eyes are glazed over and my mind snapped firmly shut . . . as any consistent reader of my editorials can testify.

Packet has to do with digital communications or some such nonsense. All I know is that it makes a racket on the band and probably should be moved back to 2m or higher. It doesn't even use tubes, a hand key or even a good old microphone. And it won't be any good in emergencies when we'll need to use a Ford spark coil, a car battery and key it by touching two wires together, so let's get back to fundamentals and stop messing around with microprocessors and other such solid-state garbage.

Of course, if you're reading anything but ham magazines, you know that the world is going digital. Now they're working on a world satellite communications system which will allow us to have a communicator in our shirt pocket which will give us cellular telephone/fax from anywhere. I saw a picture of some guy with his laptop computer sending messages from the Staten Island ferry! So you can see that the commercial outfits will soon be providing all of the communications we can possibly want and we won't need amateur radio any more. Of course the downside of this is that they're going to need a lot more spectrum to provide this service and guess which service has the most almost totally unused microwave frequencies and the least political clout—which is measured in terms of PAC donations to Congressional re-election campaigns—these days?

Yes, packet is kinda slow right now. On our shortwave bands it needs to be developed so it'll have more throughput and a better ability to ignore interference. On the higher frequencies the packet pioneers have been moving traffic at higher and higher speeds, so I can understand the panic this must be generating in Newington to an organization dedicated to CW message handling . . . a Radio Relay League. I'm not sure exactly what a whipper-snapper is, but I am convinced that whipper-snappers should be driven out of the hobby so we old-timers can exchange signal reports and weather information at 10 words per minute.

Do-It-Yourself Education

Millions of people are being thrown out of work as companies, mainly larger ones, downsize. Production workers are replaced by automation, cutting down on blue collar jobs. Other production work is moved to Mexico or Asia, chasing lower wages for low-skilled work. This isn't heartlessness, it's capitalism at work. It's also that most fundamental rule of nature (God, if you like) about the survival of the fittest—natural selection. The smarter are surviving, though smart, in this case, has little to do with IQ, and everything to do with figuring things out, which almost anyone can do—if they think.

Using modern tools to increase productivity without having to work harder or longer—working smarter, we call it—will win out over sweat and grind in the long run. Despite the proliferation of computers, the one place we've lagged seriously behind in productivity has been in white collar work—but we're finally beginning to catch up with the productivity gains manufacturing automation has brought to the production floor. And this means that office workers who work smarter are going to replace those who've refused to learn. And that means unemployment for those too preoccupied with non-work related education.

Scientists, engineers and technicians (the smocks) invent the products; blue collar workers make them; white collar workers market 'em. As any look through the want ads will tell you, we're terribly short on smocks these days. We're up to here in unneeded low-productivity blue collars and we've a growing surplus of the same in white collars. The smarter people are aware of this change and are coping with it by improving their education. A high productivity worker will never be out of work for long.

So how do we learn more and avoid the humility of being unemployed? Do we go back to school, perhaps taking adult courses? And if we do, in what? Or should we go to Barnes and Noble and see what books we can find to help? How about attending conferences and workshops?

It doesn't take a lot of smarts to discover that the money is in the white collar section. Skilled smocks and blue collars are never going to make much because they aren't on the end where the big money lies. The big dough is in sales. It doesn't take a genius to see that perfectly wonderful products are losing the sales battle right and left. So much for the value of the smocks. There's almost no correlation between how good a product is and how well it sells. One only has to look at the music industry for proof of that.

It took me a while to figure this out. I got sucked into going to an engineering college because I was into ham radio when I was in high school. I had a great interest in electronics, radio and audio, so I got conned into engineering. Then along came WWII and four years in the navy. By that time I was smarter, so as soon as I returned to college, I changed from engineering to the management of technology. Good move.

But how does the average Joe cope with the changes going on? One of the best ways is to at least dip one toe into entrepreneuring—to start a small business, even if it's in one's spare time. I've recommended that those of the amateur radio persuasion consider getting involved with security products sales, installation and service. Or TV and computer repairs. Things like that where your supposed knowledge of electronics will give you an edge. Of course if you cheated in getting your ham license and merely memorized Q&As from the ARRL or Dick Bash, you haven't much to start with. If your interest has been in blathering endlessly on the air and not in learning more about the technology, you've been wasting a golden opportunity. You aren't contributing any more to society or yourself than you would as a beer-drinking couch potato watching sitcoms and ball games.

The Publishing Entrepreneur

One way to take advantage of an interest is to start publishing a newsletter and then let it get out of hand. This was what got me hooked. I was having a ball with RTTY back in 1949, but I wanted to learn more and there weren't many information sources. In 1951 I went to work for WXEL in Cleveland as a TV director and by golly, there was a perfectly good mimeograph machine, just waiting for me to start a newsletter. Thus was born *Amateur Radio Frontiers*, my first publication. Thus started a life-long learning experience which has done well for me.

As a publisher you learn to write, edit, set type, lay out pages. You learn about

Continued on page 74

STANDARD SETS THE PACE FOR HANDHELDS

NEW UNIQUE STREAMLINED DESIGN C188A/C488A VHF-UHF FM HAND HELD TRANSCEIVER WITH "HEC" HIGH EFFICIENCY CIRCUITRY AND WIDE VOLTAGE OPERATION INTERCHANGEABLE 40-200 CHANNEL MEMORY CHIP

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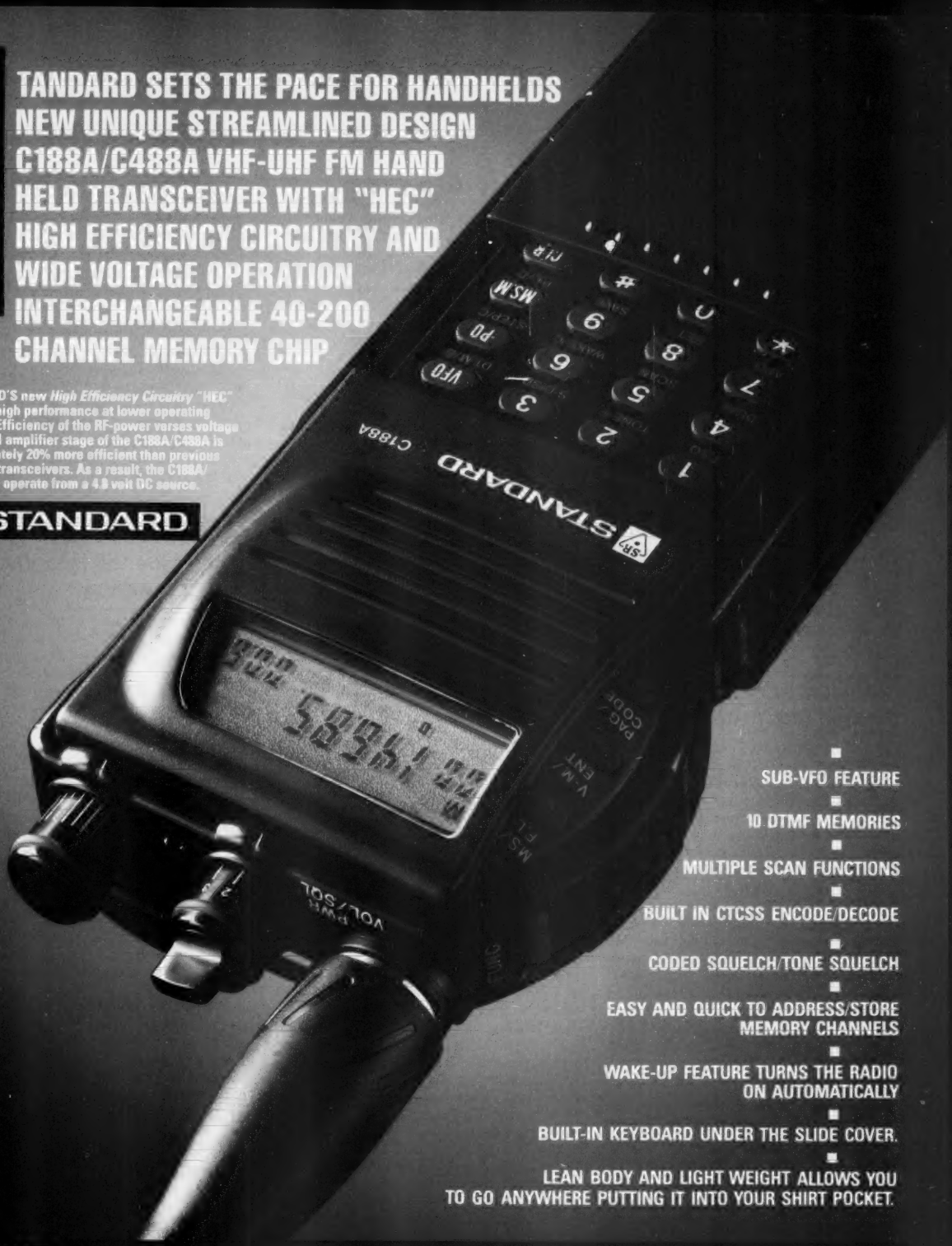

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Christopher Columbus Award

The Radio Amateurs of Genova, Italy, have organized the Christopher Columbus Award to commemorate the 500th anniversary of the explorer's discovery of the New World. Christopher Columbus was born in Genova. Amateurs earn one point for working Italian stations, three points for working stations in Genova, and five points for working Special Event Stations IQ1CC and IQ2CC, which will be active from Genova and Milan some weekends during the award period: Sept. 1—Dec. 31 1992. Italian amateurs need to make 50 points, Europeans 30 points, and others 10 points. At least one contact each with a station in Genova and one Special Event Station is required. All bands and modes; SWL ok. Send log data, including reports exchanged, by June 1993 to ARI Award Manager, Via Scarlatti 31, 20124 Milano, Italy. The fee is US$6, 10 IRCs, FF35, DM10, 10 Swiss francs, £3.5, or 1,000 Italian lira. *TNX The DX Bulletin, Issue 649, August 7, 1992.*

Ohio and Other Packet SysOps Ban ARRL Traffic

Packet BBS systems operators throughout the state of Ohio, joined by several other SysOps scattered across the country, have placed a ban on all traffic to and from the American Radio Relay League as their way of protesting a decision by the ARRL's Board of Directors to seek regulations that would permit only semi-automatic, rather than fully automatic, packet forwarding on the HF bands. In their letter to Great Lakes Division Director Al Severson AB8P, and disseminated nationwide via packet radio, the SysOps made it clear that the ban on traffic to and from the ARRL headquarters station would remain in effect until the League capitulated and gave its blessing to unattended fully automatic HF packet message forwarding. *TNX Westlink Report, #631, August 14, 1992.*

No-Business Rule Debate Opens, Docket 92-136 Released

The FCC is now actively seeking comments on its proposed revision to Section 97.113 of the amateur radio rules, the so-called "no business" clause that many hams and Commission staffers feel to be counterproductive to the Service.

On July 2nd, The Commission issued its Notice of Proposed Rule Making in P.R. Docket 92-136, to amend its rules regarding permissible amateur communications. The proposal was initiated by several letters and petitions, and is based in large part on an ARRL informal proposal. The Comment deadline is October 1st, with reply comments due December 1st.

If adopted, the new rules would relax restrictions on public-service-related communications—such as for parades, races and fairs—which currently are prohibited. More information on Docket 92-136 appears in the August and September issues of *QST Magazine*. And the Amateur Radio Newsline has announced that it hopes to hold a National Teleconference Radio Network to discuss this matter in a national public forum in early September. *TNX Westlink Report, #630, July 31, 1992.*

ICOM Recall

ICOM has recalled all of its new "P" series 2 meter and 70 cm hand-held transceivers. The company has acknowledged that a problem exists with leaky lithium batteries that have shown up in a couple of units. While the problem does not appear to be widespread, ICOM is not taking any chances. Owners of the "P" series talkies are asked to call ICOM America at (206) 454-7619 for return authorization. All modified handhelds will be covered by an additional one-year factory warranty. *TNX Westlink Report, #631, August 14, 1992.*

FCC: No More SAREX Waivers Needed

Since the beginning of manned amateur radio operation from space, it has been necessary to obtain waivers from the FCC for every astronaut operator of a SAREX station. This was because FCC rule 97.207(a) required the operator of an "amateur radio space station" to hold an Extra class license, and none of the astronauts who have operated from space ever did.

Bowing to requests from the amateur radio community and SAREX planners, the FCC on July 1st revised Section 97.207(a) to authorize any amateur radio license holder to be the control operator of a space station subject to the privileges of the license class held by that operator. The FCC defines a "space station" as being any amateur radio station that is located more than 50 kilometers above the earth's surface and which transmits and receives on frequencies that are allocated specifically to the Amateur Satellite Service.

But with this change come two caveats. First, the FCC chose not to define a "spacecraft" as being a "ship," thus opening the door for virtually any licensed individual with the necessary dollars and initiative to put up a space station of his own. Although this is certainly not likely, it is interesting that this possibility now exists.

Of even greater consequence is the fact that the FCC has mandated that the Volunteer Examination Coordinators rearrange their question pools to include the topic of operating a ham radio from space. In other words, while most radio amateurs will never have the opportunity to operate from such a location as a space shuttle, the FCC wants all hams to know, understand and be tested on this aspect of amateur operations.

The FCC action to amend Section 97.207(a) was based on a petition filed in February by former West Gulf ARRL Director and Vice President Jim Haynie WB5JBP. *TNX Newsline; K6DUE; and Westlink Report, #630, July 31, 1992.*

FCC Proposes to Bring Novice License into VEC Testing Program

The FCC has issued a Notice of Proposed Rule Making in P.R. Docket 92-154 that would require Novice class license examinations to be administered by the Volunteer Examiner program, which now administers all other license class examinations. The plan, released on July 23rd, is essentially as proposed by the ARRL and W5YI VECs and described in the April 1992 issue of *QST*, page 63.

The Commission's NPRM notes that codeless Technician class is now the entry-level license of choice over the Novice class, that the FCC is burdened by an application error rate of 9.4 percent for Novices as compared to only 0.8 percent for VE-administered examinations, and that no pass versus fail records are available from Novice examinations, as they are for VE-administered exams.

The FCC believes that bringing Novice exams under the VEC system would be in the public interest. It says that it strongly believes that the VEC-administered amateur system "has demonstrated both its efficiency and its integrity. We conclude that Novice class amateur operator examinations would benefit from those same two virtues."

Opposition to this plan has been primarily a concern that Novice exams would not be as readily available, especially in sparsely populated areas of the country. The League's response was that the explosion in new Technician licensees since the advent of codeless Tech class in April 1991 would indicate that VE examinations are readily available in most areas. The FCC NPRM did not directly address this question, although alluded to it in noting that the Novice is no longer the preponderant first license.

The comment deadline is October 9, 1992. Reply comments must be filed by November 9, 1992. *TNX ARRL, Newsline, and Westlink Report, #631, August 14, 1992.*

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CIRCLE 152 ON READER SERVICE CARD

Packet on the Mac

Connect with the world without a TNC.

by Dexter Francis KD6CMT

Santa Claus didn't bring me a TNC for Christmas. My anguish was compounded by all the magazine articles which appeared late last year about packet, and low cost TNC-less packet in particular. It seemed that every other page in *73*, *Radio Fun* or *QST* had ads for packet modems and software—all for DOS-based PCs or Amigas.

Although I had spent several years using DOS-based computers before making the switch to the Macintosh, I had no intention or desire to change back just to do packet. So, the only "sensible" option was to figure out how to do packet with my Mac. This was to prove both harder and easier than expected. Fortunately, I have some very talented and supportive friends who are dedicated to both the Macintosh and amateur radio, and were willing to get involved: Ross Wille N6SJD, Aaron Wohl N3LIW and Jim Van Peursem KEØPH. Ross had built the "Poor Man's Packet" project (*73*, August 1991, p. 8), Aaron had been wanting to write some software to act as a TNC for the Macintosh, and Jim had been developing a Macintosh application to do packet.

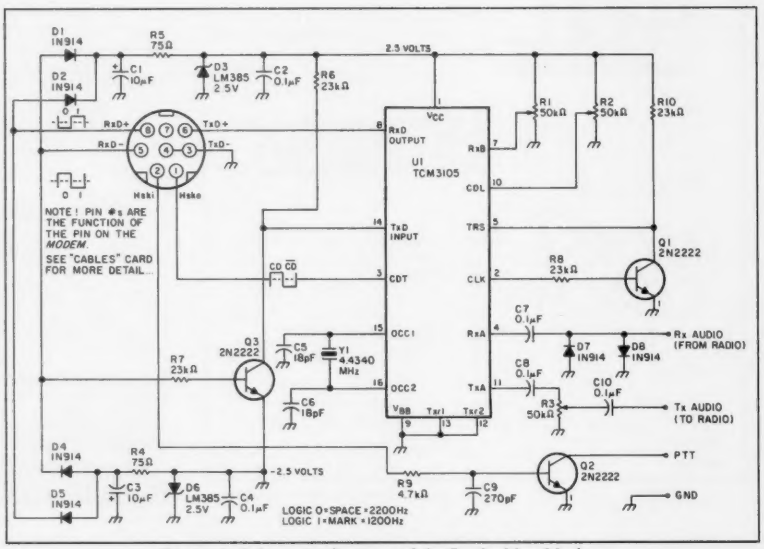

Figure 1. Schematic diagram of the PacketMac Modem.

Overview

Digital communication over a radio (packet, fax) isn't all that different from sending data via telephone. In both cases the digital data is converted into audio tones (modulated), sent from one computer to another, and converted back to digital signals (demodulated). In most cases just two audio tones are used, one representing a "mark" and the other "space." These terms refer back to the days of punched tape and teletype and have corresponding binary "one" and "zero" bit values. All the letters, numbers and symbols of the ASCII character set can be sent in this way. The hardware to do this is called a modem.

Packet-based communication is a bit more complex: It uses a NRZI data encoding scheme, breaks the data up into chunks (packets), addresses and orders those chunks, sends them out over a network and re-assembles the packets back into the original message at the other end. There is a lot of bit-munching going on, which requires some data processing power. Most radio-based packet systems use a Terminal Node Controller (TNC). The TNC's primary function is to act as a traffic cop: addressing, assembling and disassembling the data packets, doing error checking and transferring data bits to and from the modem.

Many TNCs are built around a microprocessor chip and a serial communications controller chip (SCC). One of the most popular SCC chips is the Zilog Z8530/85C30. It has built-in support for what is referred to as High Level Data Link Protocol (HDLC). The Macintosh uses the 8530 to control its serial and AppleTalk ports. In fact, AppleTalk is a packet-based networking environment. Because of this, the Macintosh is an ideal platform for packet radio. The 8530's HDLC mode can be accessed by software, eliminating the need for an external TNC. Many link layer functions can be performed quickly and efficiently by the Mac's built-in SCC hardware. Fortunately, you don't need to know the details of all the layers of the ISO Open Systems Interconnection Reference Model (OSI-RM), HDLC, and AX.25 to do packet. For those who do want to know more, there is an excellent overview of the ISO OSI-RM standard, including the role of HDLC, upon which the CCITT AX.25 packet protocol is based, in Chapter 3 of *Your Gateway to Packet Radio*, by Stan Horzepa WA1LOU, and a full chapter on packet in the *ARRL Handbook*.

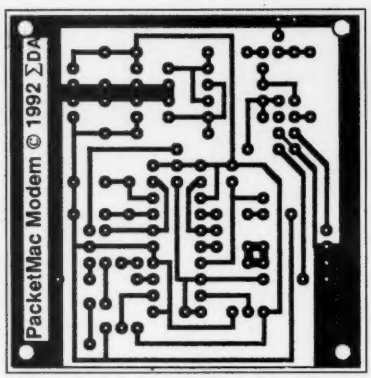

Figure 2. PC board foil pattern for the PacketMac Modem.

The PacketMac Modem

Readers of *73* may be familiar with the Texas Instruments TCM3105 Audio Frequency Shift Keying modem chip, as it was featured in the Poor Man's Packet project last year. Unfortunately, the differences between the Mac I/O ports and most other PCs made powering the Poor Man's Packet circuit impossible without some changes.

PMP took it's power from the PC's parallel port and was configured to run off +5 volts. We could get just +5 and ground off a Mac, but since the Mac serial ports supply positive and negative voltages simultaneously we can build a dual voltage regulator, keep the serial port lines and loads balanced, and use the signals to provide power as well as data. Fortunately, the TCM3105 can be run off a dual voltage supply by hooking Vdd to the most negative power rail (not chassis ground). This is the main difference between the PMP and PMM circuits.

Another consideration is that portable Macs turn off their serial port's data transmit lines to

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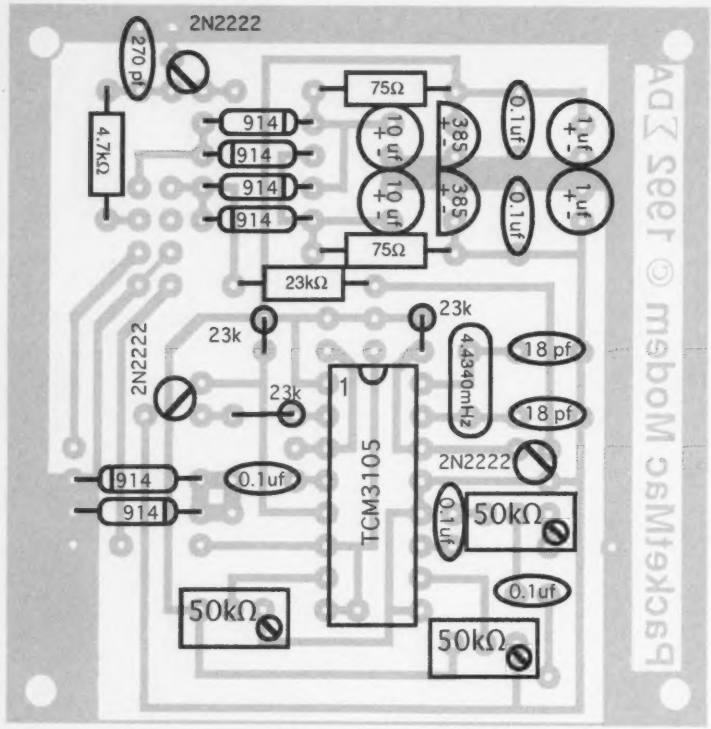
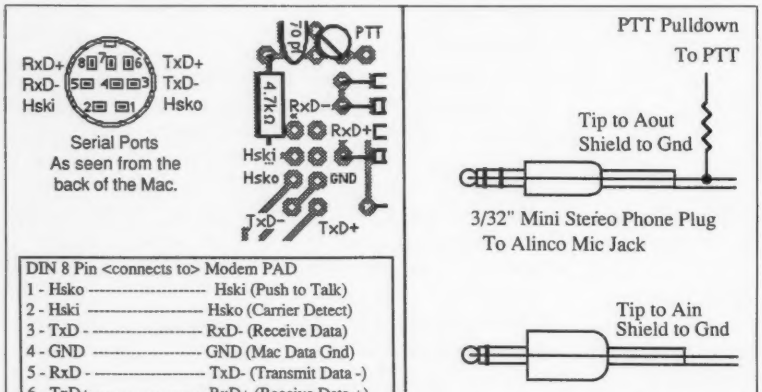


Figure 3. Parts placement.

conserve battery power when data is not being sent. Since the PacketMac Modem gets its power from the serial port data transmit lines, any software has to manage the power as well as handle data transfer.

Many computers communicate with their peripheral devices via RS-232. According to the RS-232 standard, data is sent over two wires, in an unbalanced mode, as a signal which alternates between a positive and negative voltage. Signal levels from +3 to +25 volts are a logic 0, and -3 volts to -25 volts are a logic 1. TTL data is also sent in an unbalanced mode, but with signal levels between 2 and 5 volts considered a logic 1 and signals from 0 to 0.8 volts a logic 0. The Macintosh sends serial data using the RS-422 standard, with the data being sent over two wires in a balanced mode as two alternating signals of opposite polarity (RS-422) or in an unbalanced mode with one line tied to ground (RS-423). A good reference describing the RS-232 standard is: *RS-232 Simplified* by Byron Putnam, Prentice-Hall, 1987. Also you can get a complete copy of the RS-232 and RS-422 standards from the EIA at 2001 Eye St., N.W., Washington D.C. 20006.



DIN 8 Pin <connects to> Modem PAD	
1 - Hsko	Hski (Push to Talk)
2 - Hski	Hsko (Carrier Detect)
3 - TxD -	RxD- (Receive Data)
4 - GND	GND (Mac Data Gnd)
5 - RxD -	TxD- (Transmit Data -)
6 - TxD+	RxD+ (Receive Data +)
7 - Gpi	Not Used
8 - RxD+	TxD+ (Transmit Data +)

Figure 4. Connecting the PacketMac Modem to your radio and the Macintosh. Connections to an Alinco DJ-F1 is shown.

Circuit Changes

The PacketMac Modem gets its power from the Transmit Data Plus (TxD+) and Transmit Data Minus (TxD-) pins of the Mac serial port (see Figure 1). These signals are passed through a diode bridge of four 1N914s which rectifies the AC square wave output from the serial port and charges up the two 10 µF capacitors to about 7 volts above and below chassis ground. Each rail is regulated to plus or minus 2.5 volts with the LM385-Z2.5s These regulators use very little current and stabilize Vss and Vdd to a 5-volt differential. A 0.1 µF capacitor across each rail helps to filter out any transients. A 75-ohm resistor limits the peak current on each rail to about 10 mA.

The rest of the circuit is very similar to Poor Man's Packet, except that the Transmit Data Minus (TxD-) line from the Mac is inverted and used as the digital data input to the modem chip (TXD, pin 14) rather than pin 15 from a DOS PC's printer port. Carrier detect from the modem (CDT, pin 3) is hooked directly to the Mac's input handshake line (Hski) and the PTT switching is performed by the output handshake line (Hsko). Note that the TxD+ and TxD- lines can be confusing: when the serial port is on but not sending data, the polarity of the pin is the opposite of its name. TxD+ goes positive and TxD- goes negative when a data bit is asserted.

Assembly

Start with the socket, jumpers and passive components. Although there is supposedly no internal connection to pin 6, I also trim the #6 lead off the socket. From there, move on to the capacitors and diodes, finishing up with the transistors, crystal, and variable resistors. The board is sized to fit in a box with the mounting holes on 2" centers. See Figures 2 and 3.

Calibration and Testing

There are only three things to adjust in the circuit: Carrier Detect Level, Receive Bias, and Output Level.

Carrier Detect Level: The threshold of the carrier detect circuitry can be adjusted between 398 µV and 4 mV by setting the voltage at pin 10 between 2.5 and 4.25 volts above the -2.5 V rail.

A 400 µV carrier detect level (CDL) may not seem useful in amateur radio, but it is a relative indication of just how good the TCM3105 is at picking out a weak packet signal on a channel with low background noise. I have obtained very good results setting pin 10 to 3.5 volts, which corresponds to a CDL of about 2.5 mV. TI suggests setting the signal level for carrier detect at 1.4 mV, but that is for telephone use. (With the addition of a transistor-switched LED connected to pin 3 you can get a visual indication and adjust the level for the particular channel you are monitoring.) The circuit also presents the CDL signal to the Mac's Input Handshake line, so the software can use it as well.

Receive Bias: The voltage at pin 7 (Receive Bias) must be adjusted to minimize the distortion in the square wave output at pin 8 (Receive Data). The Mac wants a clean square wave with equally spaced rising and falling edge transitions (50% duty cycle). Since we are setting up the

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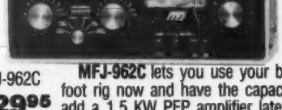

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Circle 86 on reader service card.

modem to run Bell 202, the midpoint of the mark and space frequencies is 1700 Hz. You can use HyperCard or any other sound-capable application to play a 1700 Hz sine wave out of the Mac's headphone jack and into the modem's audio input. The amplitude of the audio signal should be less than 0.78 volts peak to peak. (Setting the Mac's speaker volume to "1" produces an output of about 0.2 volts, which seems to work just fine.) With the 1700 Hz tone playing, set the voltage at pin 7 to 3.5 and slowly bring it down until the signal at RxD goes low, then increase the voltage at pin 7 slightly, until pin 8 goes high. The receive bias should now be correctly set.

Output Level: Since every radio's audio input requirements are different, you'll have to experiment to get the best modulation on transmit. However, the modem's output level can exceed 2 volts RMS, so be careful not to blow up your microphone input. Start out low and turn the output level up until there is no increase in modulation. One easy way is to monitor the transmitted packets with another radio. Keep slowly increasing the modem's audio output level until there is no further increase in loudness of your transmitted signal. Putting an adjustable potentiometer with a knob on the modem's front panel to adjust the output level is a nice feature if you intend to use the modem with more than one radio.

Tx Pulldown

Many handhelds perform the push-to-talk function with a "pulldown" resistor connected between the microphone audio lead and ground. This resistor is sometimes built into an external microphone. Since it shunts some of the audio output to ground as well as setting the DC bias level for the PTT, some experimentation with its value may be needed (500 ohms seems to work fine for the Alinco).

Typical Packet Radio Configuration

SoftKiss is a control panel that emulates a TNC in KISS mode. It is just like a printer driver—once it is installed and configured, you can't tell it is there. There are some parameters to set, just like with a TNC, in order to conform to the rules for packet transmissions in your area. These parameters can be set with a terminal emulator, or the PacketMac Modem Hypercard stack, or any other application that can send ASCII text to the serial port.

SoftKiss Parameters (default value):

digipeat—ID to digipeat out of a particular serial port.

tx delay—Time for keyup, receiver PLL lock, squelch to break, sync detect. (300000)

dwait—Give priority to digipeated packets (15).

xmit persist—Roll a 1000-sided die and compare the result to 1000 to determine how aggressive SoftKiss is in transmitting into a packet channel. (100)

xmit slottime—How often to decide to transmit. (100)

Precise control of "fast" radios, like the Kantronics D4-10, is obtained by measuring time in microseconds. Most TNCs only give millisecond resolution.

If you have two radios and two PacketMac modems, you can set up a crossband digipeater. When SoftKiss receives a packet on either port it can automatically route it out the other port if the packet requests to be digipeated by the ID of the other port.

You and your friends can share a radio on AppleTalk using NET/Mac. The "attach AppleTalk" command in the autoexec.net file controls access to your radio via AppleTalk.

SoftKiss Theory Of Operation

SoftKiss replaces the standard Apple serial input and output device drivers for the selected port(s). These "fake" drivers emulate a TNC in KISS mode and control SoftKiss. It also installs interrupt vectors to control the SCC hardware. The source code for SoftKiss is about 800K bytes and is available from Aaron Wohl N3LIW or on CompuServe in HamNet lib 9. This may be of interest to other hams working on connections to the SCC hardware.

Planned Enhancements

Bob Finch is doing an interface to Apple's MacTCP driver. This will let you use the commercial and university versions of telnet, ftp, finger, hyper tcp, mail, etc. Aaron is also doing an AppleTalk interface. This will allow you to access printers and AppleShare disks from your local picnic table.

We are also planning on adding features to dynamically modify the parameters which influence the speed and quality of packet transmission and reception and full hardware data carrier detect.

Savant

The only Macintosh applications we know of which communicate with the KISS protocol are NET/Mac and NOS by KA9Q. Both have their roots in the MS-DOS environment. Their user interface is "command line" driven. Our ultimate goal is to develop a complete Macintosh hardware/software package that is powerful and easy to use.

Jim Van Peursem, author of Virtuoso, is developing an application for the PMM and SoftKiss called *Savant*. Like *Virtuoso*, it will be a packet radio communications program with many useful and powerful features: a split window interface, with one panel for information received and one for information that has been sent; and a keyboard buffer window so you can type in long messages and make changes before sending. It will also have a scripting language, so many of the most common tasks can be automated and placed in a menu command. Since the application software will be driving the AX.25 session, it will have much greater control capabilities. The command line interface will be replaced by a full Macintosh graphical user interface. Commands you now need to remember and type to the TNC will be handled automatically by the program. Each channel will have its own window. Reading your mail from the local PBBS will be as simple as selecting a single menu command. For more information on *Virtuoso* or *Savant*, see "New Macintosh Packet Program Released," in the ARRL's *QEX*, May 1992, p. 17; or contact Jim Van Peursem KEØPH directly at 4140 Jay Avenue, Orange City IA 51041; internet—jvp@cpre1.ee.iastate.edu.

PacketMac Modem HyperCard Stack

While testing and calibrating the PacketMac Modem, HyperCard was used to make a stack with built-in sound resources, a loopback test and parameter setting. It includes a full parts layout, and an audio cable hook-up for the Alinco DJ-F1. This was done as a construction aid for members of the Apple Amateur Radio Club, who have built several modems. This stack and PacketMac Modem Kits are available from the author, c/o Sigma Design Associates, 22150 Berkeley Court, Los Altos CA 94024; CompuServe: 70611,1340; internet: Francis4@Apple.com.

The kit, including a 3.5" disk with Soft Kiss, Net/MAC and the Hypercard Stack is $30 plus $2 S&H. You may also send an SASE ($0.58 postage) and an 800K 3.5" disk for the software alone. A drilled and etched board is available for $3.50 plus $1.50 S&H from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

Getting on the Air with NET/Mac

NET/Mac is a Macintosh port of Phil Karn's KA9Q Internet Protocol Package software. We have been using NET/Mac as our packet application, since it has software support for AX.25, while we continue to develop the AX.25 stack and *Savant*.

NET/Mac is very powerful and very DOS orientated. It supports TCP/IP and FTP as well as AX.25. A number of people have contributed to NET/Mac; Dan Frank, Dewayne Hendricks WA8DZP and Doug Thom N6OYU in particular.

If you want to use NET/Mac to get on the air there are some changes you will have to do to the autoexec.net file. While they aren't very difficult, they are important and may be somewhat confusing if you've never had to do an autoexec file. (You DOS users can breeze through this section.)

What Goes Where

When you receive NET/Mac, there are seven files located in six folders. NET/Mac expects them to be in certain places, and Autoexec.net has information in it to identify you and keep everything running smoothly.

I place it all in a folder named NET. The directory structure looks like this:

```
NET folder
    Net/Mac              (application)
    Autoexec.net         (parameter/configuration file)
    Callbook.log         (callbook log file)

    pub folder
    hosts.net            (listing of host stations)
    ReadMe
    spool folder
        log              (session log file)
    mail folder
        <empty>
        mqueue folder
        sequence.seq
    rqueue folder
        <empty>
    finger folder
        <empty>
```

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The 35" main loop is made of Iridited aluminum and is welded to the tuning capacitor to reduce loss. All welded connections and the custom capacitor further minimize losses. The very low impedance of the radiating loop (typically 0.06 ohm) is matched to 50 ohms using the technique of mutually coupled air core inductors—essentially lossless impedance matching.

Technically speaking, the IsoLoop 10-30 HF is the big value in small antennas.

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Connect with us

The Autoexec.net file sets the AX.25 parameters and tells NET/Mac who you are and where to find things. The complete file has lots of comment lines in it. The comments describe the function of the lines, but take up a lot of space. You should also get a current host.net file from your local IP administrator or BBS as soon as possible. An asterisk "*" marks the end of the lines you need to change. The procedure is:

1) Change all instances of callsign to your callsign. (lines 1, 2, and 21)

2) Put in your IP address if you have one. (line 4) (numbers 241-254 are set aside for experimental use)

3) Put in the correct path name to get to the log file. (line 10)

4) Put in your time zone and offset from GMT. (line 17)

5) Put in a beacon message, if needed. (line 21)

6) UN comment the beacon enable line if needed. (line 23)

Note: In some areas, activating the beacon will garner the wrath of the local packet gods. Use with discretion!

```
hostname callsign*
ax25 mycall callsign*
attach asy 1 a ax25 ax0 2048 256 9600
ip addr [44.4.0.246]
route add default ax0
ip ttl 16
tcp mss 216
tcp window 432
tcp irtt 5000
log <path to log file>*
start smtp
start ftp
start echo
start discard
start telnet
start finger
tzone <offset to GMT eg: PDT 8>*
mbox y
beacon set ax0
beacon callsign QST
beacon message "[callsign] Mac TCP/IP
   station, City, State.Country*
beacon interval 1200
#beacon enable*
is_es enable
ip heard on
arp add [44.4.0.0] ax0 QST-0
ax25 digipeat on
ax25 maxframe 1
ax25 paclen 256
ax25 retry 6
ax25 window 4096
ax25 t1 15000
ax25 t2 10000
ax25 t3 180000
ax25 heard on
param ax0 1 60
param ax0 2 100
param ax0 3 10
param ax0 4 3
param ax0 5 0
```

Use TeachText to edit the autoexec.net file. Don't let any line get longer than 40 characters. Punctuation marks, spaces, carriage returns, tabs and other non-text characters should not be used except between the quote marks that mark the beginning and end of the text in the beacon message line.

Definitions

SCC (Serial Communications Controller Chip)—The dual port 85C30 chip that controls the serial port in a Macintosh. The 85C30 programming manual is available free of charge from AMD at 1-800-538-8450.
AX.25—The format for packets that can be sent during unattended transmission. The AX.25 protocol manual is available from the ARRL.
IP/TCP—A popular set of protocols.
NET/Mac—A port of KA9Q's (Phil Karn) tcp/ip implementation by Dwayne Hendrics and Douglas Thom. Available from Compuserve in the HamNet forum lib 9.

Construction Tips and Techniques

One of the most enjoyable aspects of this project was that the Macintosh was used at every step of the design. MacDrawPro was used to lay out the circuit artwork. A LaserWriter was used to print on the TEC-200 film from which the boards were fabricated. Laser printing on TEC-200 was probably the most interesting discovery of the entire process.

The instructions which come with TEC-200 state that you should run the film through a copy machine. I tired that with very mixed results. Since laser printers are essentially half of a xerographic copy machine, I thought I'd try printing the artwork with a LaserWriter.

Laser printers transfer a mixture of carbon dust and plastic (toner) from their print drum onto the paper and then carefully run it through a "fuser" roller which heats the toner up and melts it. The melting point of TEC-200 is high enough that the toner can be transferred to it and fused without the TEC-200 being damaged. This leaves a positive image of the artwork on the TEC-200 which can then be transferred to a PC blank with a hot iron, much like iron-on T-shirt transfers. Since the fused toner is water resistant, it also resists water-based etching agents. If you lay out and print the PC artwork as though viewed from the component side (as in Figure 5), the image is automatically reversed when you iron it onto the foil side of the board blank. *[Ed. Note: With a normal PC board foil pattern you will have to do an intermediate step using a transparency or another sheet of TEC-200 film to flip the PC board foil pattern when using TEC-200 film process. Figure 5 is already inverted for direct use with TEC-200 film.]*

It helps to clean the PC board well (with a mildly abrasive kitchen cleanser and a scuffing pad) and wipe down the TEC-200 with an oil-free, alcohol-based window or white board cleaning spray before running it through the printer. Use the single sheet/envelope slot and try not to bend or squeeze the film after printing. The fused toner is brittle and will crack and flake off if you aren't careful.

A 0.50 millimeter rapidograph pen with a water resistant ink cartridge works very well for touch-ups and produces boards that look almost as good as commercially done photo etch. Size the pads to 0.040" o.d. and set the line width to two points (about 0.030"). Lines wider than two points may develop "cracks" down the middle due to toner migration, but you can touch these areas up with an ink pen or resist pen after you've transferred the layout to the PCB blank. Use the rulers and grid lock options in MacDraw to keep your pads and traces aligned. I lay out the pads first, generally on 0.10" centers, and then move the pads in front of the traces. This is important: If the trace lines are on top of the pads, the end of the trace lines will obscure the open area in the middle of the pads. We want the pad centers etched away so they will be easy to drill. (The etched-out depressions in the pad centers are a natural drill-centering feature.) Some gentle brushing or probing with a pencil or toothpick during etching will break the bubbles which tend to form there. This will help assure the copper is completely etched away in the centers of the pads. I also cut the TEC-200 down to an 8-1/2" x 5-1/2" size and run it through the feed slot with the 5-1/2" direction as the width.

Connecting

Plug the PacketMac Modem into your Mac's modem port. Open Softkiss by double-clicking on it's icon and set the modem port for Kiss Mode TNC. If you want to run off the printer port you can set it for Kiss Mode TNC, but you will also have to change the attach line in the autoexec.net file to read:

```
attach asy 1 b ax25 ax0 2048 256 1200
```

This is because the Mac's printer port is port **b** and the modem port is port **a.** Configure Softkiss **before** launching Net/Mac.

A complete operation manual for NOS, the DOS version, is available on CompuServe in Ham Library 9 as NOSGDE.TXT. The latest version of Net/Mac (2.3.3) also has online help and an appendix with information on setting up the autoexec.net file.

When you run Net/Mac and invoke the connect command, a window will open up that will be named by the text string you define. For example:

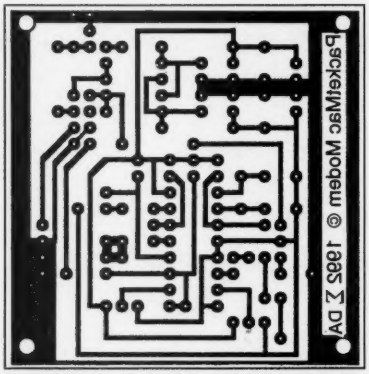

Figure 5. Inverted PC board foil pattern for use with TEC-200 film only. This pattern will eliminate the transparency inversion step required in the TEC-200 procedure. Do not use this foil pattern if using standard photographic methods (use Figure 2 instead).

c ax0 n0ary-1 (connect <interface> <callsign> [digipeaters]) connects me to NØARY-1,

Continued on page 85

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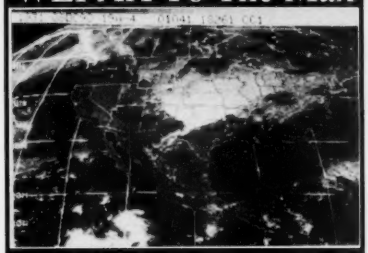

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73 Review

by Jeffrey Sloman N1EWO

The AEA IsoLoop™ 10-30

A big antenna in a small package.

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Price Class: $349

Can a two-inch aluminum band a little over three feet in diameter work as anything more than a dummy load on HF? The textbooks say it can, and AEA has proven it with the new IsoLoop 10-30. Loop antennas have been in use from the beginning of radio, but practical loops for use at HF frequencies face several engineering problems and real world limitations that AEA has managed to overcome.

The IsoLoop is a 43-inch aluminum loop, with a center portion—made of UV resistant, injection molded high density polyethylene—shaped roughly like a dumbbell. In the center of the dumbbell section is a hole designed to accept a mast up to two inches in diameter, along with stainless steel hardware for clamping the antenna in place. A stainless steel hose clamp is provided for mounting the antenna radially, for use from, say, a balcony railing. The stainless U-bolt is also needed, and it is a minor inconvenience that the antenna housing must be disassembled—three hex bolts with nylon-retained aircraft nuts—to remove it from its default center position.

In the larger end of the dumbbell is a 10,000-volt split-stator capacitor. The two ends of the irradiated aluminum band that makes up the loop are welded to the two halves of the capacitor's stator. This one-piece design is very rugged, its only downside being the need to deform the loop to fit it into a UPS-shippable box. It takes some work to get the loop round again after unpacking it, though it need not be perfectly round to operate perfectly. If you are like me you will want the loop to be round for aesthetic reasons. Also in this end of the housing is a precision stepper motor and gear train for remote control of the capacitor's tuning.

On the smaller end of the dumbbell is a one-turn electrostatically shielded loop made of coaxial cable. This shielded coupling loop matches the extremely low impedance—less than 1/10 ohm—of the radiating loop to the 50-ohm feedline. It also acts as a balun which isolates the feedline from the antenna—the effect that gives the IsoLoop its name. The input to the antenna is through a supplied right angle PL-259 adapter which helps to route the coax at a 90 degree angle to the antenna. The antenna must be mounted with the SO-239 connector facing down, along with the drain hole also located on this side.

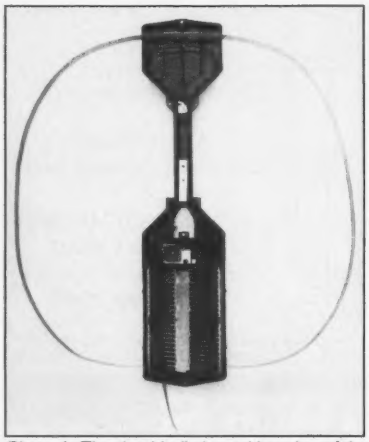

Photo A. The dumbbell shaped housing of the IsoLoop contains a 10,000-volt split-stator capacitor, a stepper motor, and a one-turn loop for impedance matching.

Also in the package are the LC-2 controller—for tuning the antenna—and its 12-volt wall mount transformer power supply. The LC-2 is a small beige box with two thumbwheel controls, two push-button switches, and four LEDs. The left-side control—marked SENS—adjusts the sensitivity of the LED audio level indicators; I'll explain these later. The control on the right—marked SPEED—adjusts the pulse rate of the signal sent to the stepper motor located in the antenna, which adjusts the tuning speed. The push-buttons control the direction of the capacitor's travel. On the back of the LC-2 are jacks for power (standard coaxial), the stepper motor (5-pin DIN), and the audio in/out (1/8 phone).

New and Improved

This IsoLoop is the new and improved version of the original IsoLoop 14-30 antenna introduced in 1990. *[Ed. Note: See the review of the original antenna in the September 1990 issue of* 73, *p. 10.]* The original had an operating range of only 14-30 MHz; AEA has added 4 MHz to the low end to cover the 30 meter band. The original used aluminum tubing and required assembly. This design was prone to loss from bad connections of the tubing sections to each other and the capacitor. The older model used a belt drive for reduction from the stepper motor to the capacitor, while the improved version uses a gear-driven reduction unit.

How It Works

The IsoLoop has a wonderfully elegant design. It is a simple tuned LC circuit, with the aluminum band providing the L and the custom designed capacitor providing the C. The connection to the antenna is made through mutually coupled air core inductors. The one-turn electrostatically shielded loop is inductively coupled to the resonating loop. Undoubtedly, many of you have already recognized this as the same design common to antennas used by BCB (BroadCast Band) DX enthusiasts. The difference between this antenna and the IsoLoop is twofold. The IsoLoop is designed for much higher frequencies and so is actually quite efficient in spite of its small size. Its efficiency ranges from about 70% on 20m to as high as about 95% on 10m.

The second principle difference is the capacitor in the IsoLoop. Designed for transmitting, it is capable of about 150W. Its split stator design avoids the moving contacts required by conventional designs. The IsoLoop achieves the ideal of placing the tuner at the antenna. This antenna tuner does what its name says: tunes the antenna! Because the IsoLoop is actually resonant, it easily outperforms practical dipoles mounted at the same height. There is some misunderstanding concerning the ability of a small antenna to perform well in the HF bands. The fact is, what is important is resonance—and this antenna resonates.

Installing the IsoLoop

Unpacking the IsoLoop is easy; it is packed in a box slightly smaller than the IsoLoop's diameter. Two small cardboard boxes contain the LC-2 controller, its power supply, and male-to-male 1/8-inch phone patch cord. The antenna slides from the box with little effort, and its 18-pound weight is not too difficult for one person to handle. Out of the box the antenna is set up for axial mounting, parallel to the earth. In this configuration

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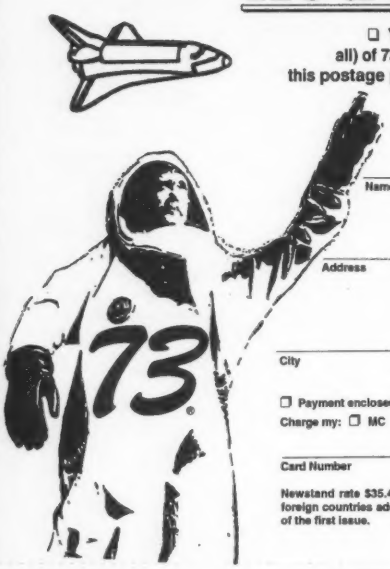

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1 Letters
2 Never Say Die
3 QRX
4 Packet on the Mac
5 Review:The AEA IsoLoop 10-30
6 2 Meter FET Amplifier
7 Review:The DAIWA DP-830
8 New Look at Loop Antennas
9 Review:The Kantronics KPC-3
10 Baby Loopy
11 Noise Reduction Using Broadband Active Whip Antennas
12 Packet Radio and Emergency Communications
13 Homing In
14 New Products
15 Hamsats
16 RTTY Loop
17 Above and Beyond
18 Circuits
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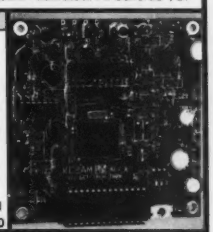

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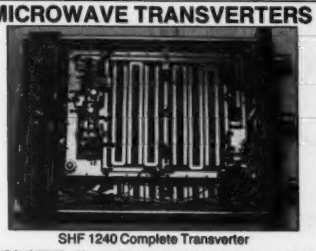

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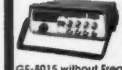
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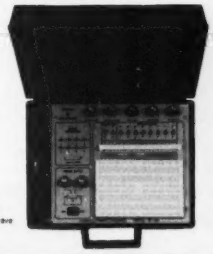

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CIRCLE 257 ON READER SERVICE CARD

Photo B. The IsoLoop's default mounting position is parallel to the earth and provides an omnidirectional pattern.

the antenna's radiation pattern is omnidirectional. A bidirectional pattern is also possible using the alternate mounting position, which places the antenna perpendicular to the earth. Since the antenna is especially good for restricted space installations—like apartment buildings—using the alternate (radial) mounting position may prove useful for installing the antenna on high-rise balconies and out of windows.

When choosing a mounting location, keep in mind that the IsoLoop will only perform properly when mounted at least four feet from large—especially metallic—objects. This includes four feet from the ground, which, while it sounds like a relatively poor location, is not necessarily that bad. The IsoLoop is a loop antenna and not a dipole. It does not suffer from the problems of a dipole located closer than a half wavelength to the earth. While four feet off the ground is clearly not ideal, the IsoLoop's radiation angle is about 37 degrees, while only a quarter wave from the earth. This low radiation angle insures better DX performance by delivering most of the transmitter's power at an angle that will take advantage of ionospheric propagation. Remember: The angle of incidence equals the angle of reflection.

While the IsoLoop was being tested here, it spent most of its time on a four-foot aluminum stepladder in the middle of the second-floor ham shack. Even in this makeshift installation the antenna performs exceptionally. In any case, while the IsoLoop is more forgiving than other antenna designs, it still works better mounted higher in the air. Its relatively small size allows for mounting with standard TV mast and hardware, and its low profile is unlikely to cause too much consternation among the neighbors.

Once the mounting location is chosen, and the antenna physically mounted, the feedline and control cable must be routed back to the transceiver. Supplied with the antenna is a right-angle adapter for the SO-239 input to the antenna. This allows the coax to be routed at 90 degrees to the antenna which minimizes induced currents in the feedline. A small piece of Coax Seal™ is included to protect the antenna connection. Fifty feet of control cable comes installed on the antenna. If this is not enough, AEA can supply 50-foot extension cables. The 5-pin DIN connector used on the control cable is a common type, and the cable itself is a shielded 5-conductor cable, so building one yourself of arbitrary length should be no problem.

Once the cables are routed back to the shack, the coax is connected to the transceiver and the control cable is connected to the 5-pin DIN connector on the back of the LC-2 control box. The LC-2 will also need its power supply connection. The supplied patch cord is used to connect the rig's speaker output to the input on the back of the unit, and an external speaker is plugged into the adjacent output. These connections are only neces-

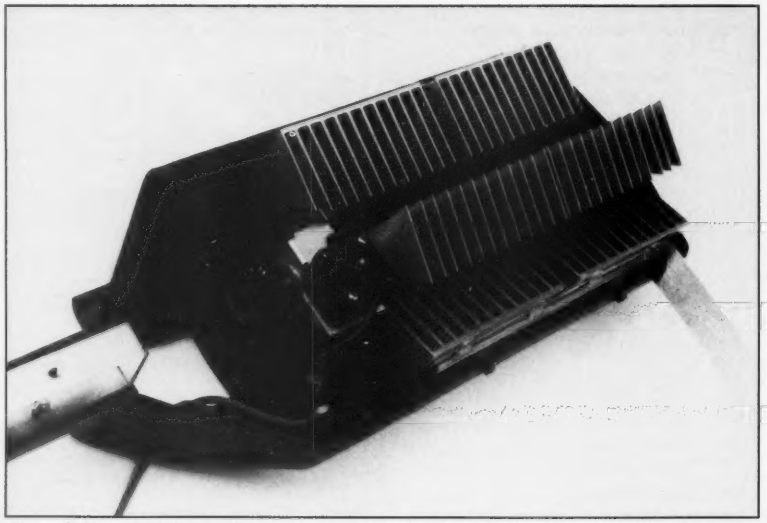

Photo C. The special split-stator tuning capacitor built into the IsoLoop is capable of handling up to 150 watts. The capacitor is remotely tuned via a motorized gear-driven reduction unit.

sary if you intend to use the LC-2's tuning indicator—which is especially useful for older radios (see the description below). Once all these connections are made, the antenna is ready for use.

Using the IsoLoop

Without some understanding of how to use the IsoLoop, you could spend several frustrating hours getting the antenna to work. Because of the extremely narrow passband of the IsoLoop, it is important to understand how to tune the IsoLoop and/or to develop a technique of your own.

Tuning the loop is accomplished with the LC-2 controller. The capacitor is driven by the stepper motor through a 30:1 gear reduction drive. This allows very fine adjustments of the capacitor, which are necessary because of the very tight resonance of the loop. The speed control adjusts the pulse rate of the signal to the stepper motor with the slowest setting providing the tiny adjustments necessary to fine-tune the SWR, while the highest speed will move the capacitor's rotor through its entire rotation in about 15 seconds. Tuning works like this:

1. Remove any antenna tuners from the feedline, and if the rig has a built-in tuner—turn it off.

2. With the speed control in the fastest position, press either direction button until the noise in the receiver peaks. This will happen quite suddenly, and the peak is very small. You will probably pass through the peak, but let go of the button as soon as you notice it. It will sound like a burst of noise. [Note: If you have an older rig with a mechanical S-meter, and you have connected—what AEA calls—the audio-visual LEDs, you can use these to observe the peak. Adjust the sensitivity control until just the left-most LED glows, and the first of the two center LEDs flicker. As you rotate the capacitor, you can watch for the peak—on the LEDs—as well as listen for it. If you have a modern rig with an electronic VU meter—one that supplements the S-meter, showing the audio level—you can use this instead of the LC-2's LEDs.]

3. Adjust the speed control to about middle speed. Press the other direction button, which will bring the capacitor back the other way, toward the peak you passed. You will not have to wait long. You will probably pass through the peak in the other direction. Alternate the directions—adjusting the speed control downward if necessary—until you feel you have peaked the noise (or signal) as best you can.

4. Adjust the speed control to its slowest position and, using an SWR meter, repeat the procedure above for the lowest reading. A correctly installed IsoLoop should tune down to about 1.5:1 or less from 10-30 MHz. Retuning will be necessary every 10-100 kHz, the bandwidth increasing with frequency. Keep in mind:

•The capacitor has no stop, it rotates freely and there is no absolute up and down related to the directional controls.

•The peak is very small; you will have to practice to make the antenna work.

•Turn off your antenna tuner! You will try forever to get the IsoLoop tuned with no success if it is on.

•Be sure to mount the antenna at least four feet from large objects if at all possible.

As you can see, the tuning procedure—while not necessarily complex—is specific. Once you get the hang of the procedure you will probably find yourself using faster and faster speeds for all but the final touch-up for SWR. You will also become better at hearing the peak. This antenna becomes better as you do. Some of you may remember a similar procedure—at least in feel—from the days before automatic antenna tuners.

Performance

I was interested in the IsoLoop because of my limited space and restrictions against outside antennas. Connected to a Kenwood TS-450S, the antenna performed brilliantly. I had the opportunity to work some band openings on 10m—and got universally excellent signal reports. Running about 25W, I was able to work the East Coast from my Indiana QTH. I had a hard time convincing some of the stations I contacted that I was using the IsoLoop and 25W—but I was. Keep in mind, too, that the antenna was indoors on an aluminum stepladder. The IsoLoop consistently outperformed a 50-foot longwire using the automatic antenna tuner in the Kenwood. I was able to monitor packet QSO on 30m, and CW and SSB QSO on 20, that were not even audible on the longwire.

Who Should Use an IsoLoop?

The IsoLoop is extremely flexible. It is the perfect limited space HF antenna, useful for apartment dwellers, those with restrictive covenants, and those with aesthetically sensitive neighbors. It is also useful for mobile applications, such as mobile homes, emergency command vehicles, and boats—but with its 15 pound weight, I would be hesitant to put it on a car (though I have heard it's been done). Even if you don't have space restrictions, the IsoLoop works better than wire antennas, is easy to install and use, and might just be the ideal antenna to supplement your tribander.

Conclusion

The IsoLoop is one of those products that is a pleasure to use. It is an elegant application of a traditional design with modern engineering. Its performance is exemplary; it will not disappoint you. 73

IsoLoop 10-30 Specifications

Frequency coverage	10 to 30 MHz (continuous)
Nominal impedance	50 ohms
Connector	SO-239
Power handling	150W
VWSR	1.5:1 or less across operating range
Diameter	43"
Shipping weight	25 pounds, may be shipped UPS

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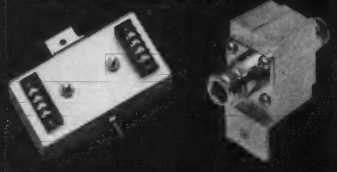

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CIRCLE 49 ON READER SERVICE CARD

A 2 Meter FET Amplifier for Your Handheld

Build this simple, inexpensive FET amplifier.

by John Cunningham AA4AW

Field-effect transistors (FETs) have numerous advantages over bipolar transistors. FETs have more gain, greater efficiency, and greater tolerance for being overloaded than bipolar transistors. They are far less likely to be destroyed as a result of thermal runaway or high SWR. They can be operated over a greater voltage range and over a greater power range—both input and output power. The drawbacks to them are that they cost more and are more likely to go into oscillation as a result of the increased gain of the circuit using them. Furthermore, they are more prone to static destruction than bipolar transistors, and great care must be taken in handling them until they are soldered on the circuit board.

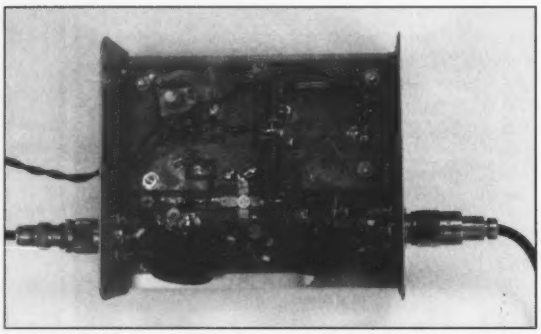

Photo. The 2 meter FET amplifier. Photo by John Cunningham AA4AW.

When I wanted more power for my handheld, I looked for a circuit that was relatively simple to build, could be built with available parts, and could operate at 13 volts. The result of several hours of research was this FET amplifier.

I chose Motorola's MRF 137 for the project because at 2 meters it will amplify inputs from a range of less than 100 milliwatts to 5 watts—the range of any handheld. The transistor is also capable of being used on 220 and 440 MHz, as well as on HF frequencies down to 2 MHz. It will operate well with 12 volts on the drain; and if more voltage is available, it can handle 30 volts comfortably. The transistor may be obtained from Motorola by calling (602) 244-6900. [Persons living in the southeast United States may call (800) 368-8163.] The MRF137 costs about $30. The MRF137 is also available for $24 plus shipping from RF Parts at (800) 737-2787 or (619) 744-0700.

Construction

I used a Radio Shack 276-1499 circuit board for this project, but any board that is approximately 3" x 5" may be used. *[Ed. Note: An etched and drilled PC board is also available (see the Parts List).]* The board needs to have foil on both sides to aid in heat dissipation for the transistor. Only one side of the board needs to be etched. I drew the pattern with a felt pencil which left the copper that was to be etched exposed. The unetched copper was further protected by duct tape. I then used Radio Shack 276-1435 etchant, following the instructions printed on the etchant bottle. All the components are located and soldered on one side of the board, similar to a ground-plane configuration—the difference being that some etching is done and some components are soldered to etched portions of the card. This design makes for improved grounding and ease of troubleshooting.

Since the ground will be in two separate halves once the RF path is etched, you must drill holes in the board to provide a proper ground path. Two holes need to be drilled on either side of the source because grounding is most critical here. One hole each should be drilled at the ground side of trimmers C2 and C4 and on the ground on the output side of T2. See Figures 2 and 4. Once the holes are drilled, small jumpers should be installed in the holes and soldered to both sides of the foil. The resultant jumpers can then be honed to make them even with the rest of the foil. Be careful not to hone too much or some of the foil may be ground away.

When the circuit board is etched and the ground jumpers installed between the foils, components can be soldered into place. See Figure 4 for the component layout, which is critical at 2 meters.

To prepare T1 and T2, 17-1/2 inches of RG-58/u coax needs to be cut. Cut a half-inch of the outer insulation off each end. Next, cut the outer conductor and the inner shield to expose a quarter-inch of the center conductor. See Figure 3. The cable then needs to be coiled four loops—each loop being slightly more than one inch in diameter. You can use tape to hold the loops in place until the cable is tied to the circuit board using tie wraps. The ends of the coax can then be soldered into place.

In addition, you will need two more small lengths of coax between T1 and T2 and the input

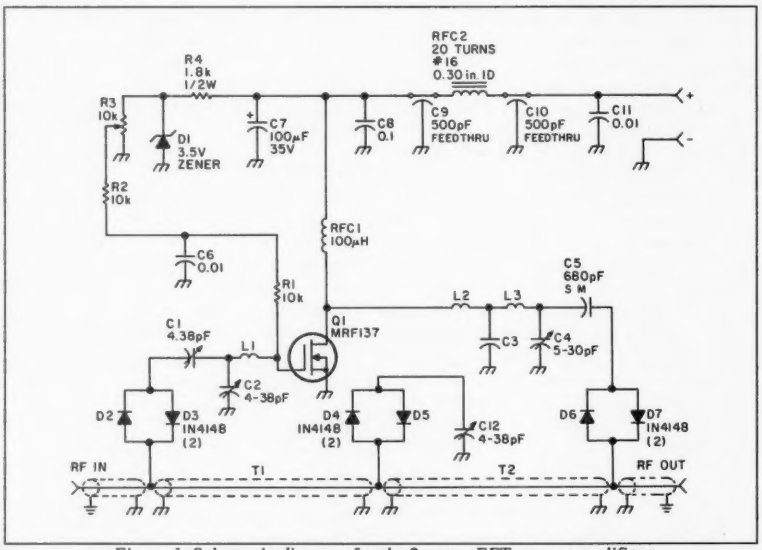

Figure 1. Schematic diagram for the 2 meter FET power amplifier.

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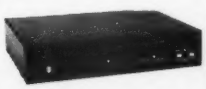

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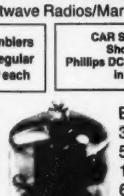

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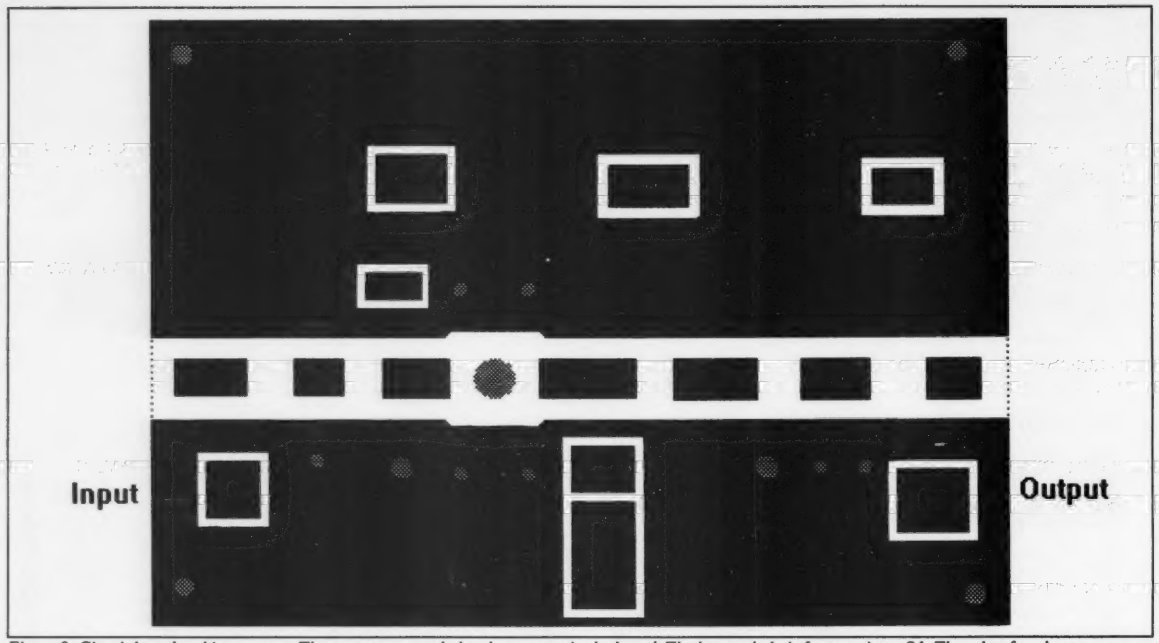

Figure 2. Circuit board etching pattern. The gray areas are holes that are cut in the board. The largest hole is for transistor Q1. The other four larger ones are for the mounting hardware, and the rest of the circular holes are for solder jumpers between the two foil layers. The square holes are for the ties that hold T1 and T2 in place. Take care that the input foil and the output foil do not go all the way to the end of the board or it might short against the walls of the mounting box once the unit is assembled.

and output connectors. Cut two pieces of coax two inches long. Prepare the ends of them the same way T1 and T2 were prepared.

The transistor should be placed on the board last. Great care must be taken in handling a field-effect transistor to avoid a static discharge which can destroy the device. The soldering iron, workbench, and circuit board should be grounded before the transistor is removed from its protective package. A ground strap worn around the wrist would also be helpful. If possible, the transistor should be picked up only by its two drain leads. Once soldered into place, the danger of static buildup is minimized.

A heat sink needs to be bolted to the transistor, using a flat washer. Thermal heat sink compound, such as Radio Shack 276-1372, must be placed between the transistor and the heat sink. Only a small amount of the compound need be used as the compound will squeeze out once the bolt is tightened.

When the components are soldered into place, you need to make resistance checks before applying power to the amplifier. If you check the resistance from the voltage input to the ground and find it high, it is safe to apply power. You can also check to see that there is zero resistance between the positive voltage and the drain of the transistor. The resistance between the drain and the gate should be at least 21k ohms. If these conditions are not met, recheck the components and their layout.

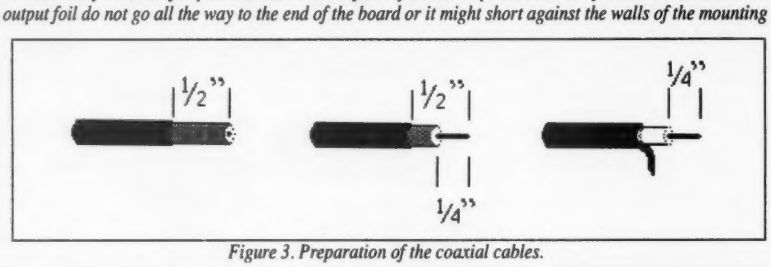

Figure 3. Preparation of the coaxial cables.

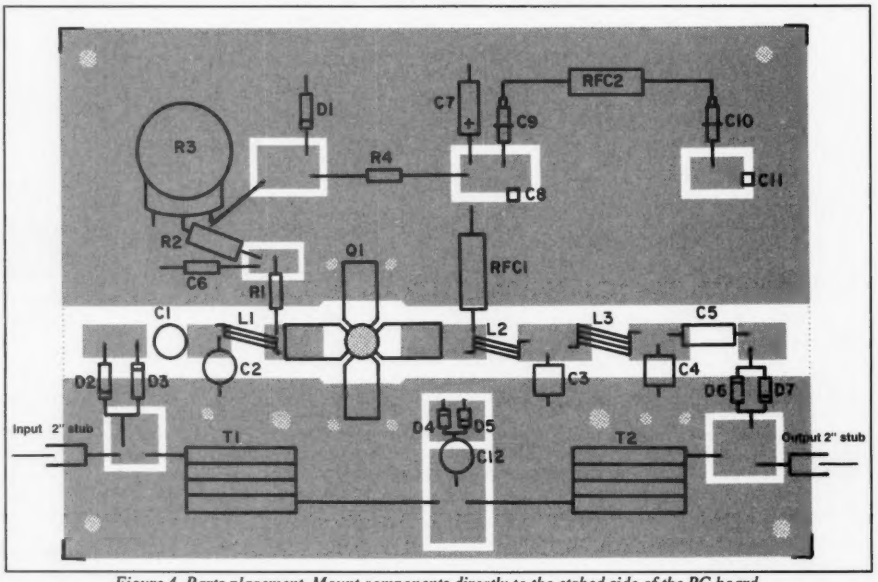

Figure 4. Parts placement. Mount components directly to the etched side of the PC board.

After the resistance checks are made, you will need to align the amplifier. To do this, you will need a 2 meter transceiver, power supply, dummy load, and some kind of power indicator. A spectrum analyzer would be ideal, but a relative power/SWR meter will work when attached to a dummy load.

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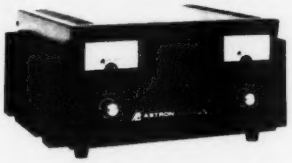

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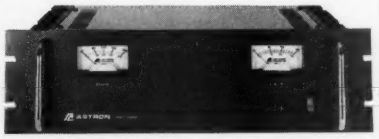

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RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
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RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

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RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

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RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

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VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
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VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

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RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

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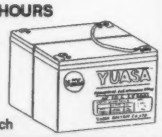

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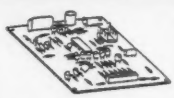

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First, apply 12 volts to the amplifier. Be sure 12 volts are reaching the drain. Also check the voltage on the gate, which should not be higher than 2.5 volts. If it is higher, adjust R3 to lower it. Any voltage higher than that may cause the amplifier to go into oscillation. Touch the transistor. If it is too hot to touch, the amplifier is oscillating and the voltage on the gate needs to be lowered by adjusting R3. If the gate voltage is lower than 2 volts, adjust R3 to raise it.

With the amplifier still on, apply 1 watt from the 2 meter rig on an unused 2 meter frequency (use a dummy load). See if there is any indication of power in the output of the amplifier. At this point it is normal if there is none. Adjust C1 for maximum power indication. There still may not be any power going through the amp. If that is the case, adjust C2, C4, C12, and R3 until you see power on the output. Keep adjusting these components until maximum power is obtained without oscillation.

If you have a 28-volt power supply, increase the voltage to that amount. The increased voltage may cause the amplifier to go into oscillation. Adjust R3 until the oscillation stops; then adjust the trimmers again. Adjust R3 and the trimmers until maximum power is obtained.

Measure the current coming from the power supply. The MRF137 has an efficiency of approximately 50 percent. Therefore, 50 watts coming from the power supply should yield an RF output of about 25 watts. At 28 volts the current coming from the power supply should be approximately 2 amps. At 12 volts the current should be slightly more than 1.5 amps.

The amplifier is designed to allow the received signal to pass through when not transmitting. Check to see that an RF signal will pass through to get to the transceiver.

How It Works

When in the receive mode, diodes D2 through D5 will not conduct because the signal level is too low. T1 and T2 do not attenuate the signal enough to be noticeable, and the center conductor of the coax allows the RF signal to pass straight through to the receiver. When transmitter power is applied, diodes D2 and D3 are forward biased and conduct power to the gate of Q1. Q1 amplifies the signal and carries it to diodes D6 and D7, causing them to conduct also. A small portion of the amplified signal goes through T2 to diodes D4 and D5, causing them to conduct. Trimmer capacitor C12 tunes T1 and T2 to an electrical quarter wavelength, thus effectively shorting one end of the transformers and making them appear as open circuits to the signal. Thus, it is almost impossible for output power to get back to the input through T1 and T2. This circuit is simpler and more reliable than using relays to switch from transmit to receive.

Coils L1—in combination with C1 and C2—match the transistor to a 50-ohm input while L2, L3, C3, C4, and C5 match the transistor to a 50-ohm output. Bias is provided by R1 through R4, and bias voltage is kept constant by zener diode Z1. Bias voltage is adjusted by R3.

Results

At 100 milliwatts (the low power output on many handhelds), the amplifier puts out 2.5 watts with 13 volts on its drain. Remember that FCC regulations and sound radio practice require that minimum power be used in radio transmissions.

This design gives 25 watts out when fed with 1 watt at 2 meters and with 28 volts on the drain. With 13 volts on the drain, the output is 9 watts—as good as can be achieved with most popular bipolar transistors under similar conditions. Furthermore, at 13 volts the transistor should easily outlast its owner since it is almost immune to damage from high VSWR and thermal runaway.

If more than 1 watt can be fed into the amplifier, there will be more power at the output. At 13 volts, 3 watts in will yield 20 watts out. Increasing the input to 5 watts will yield only slightly more power. Nothing more will be gained by going beyond 5 watts input, and too much input will cause harmonics to be radiated. By increasing the power supply voltage to 28 volts, a whopping 50 watts output can be achieved with only 2 watts input! Again, putting more power in at this point will not yield much more output power.

The amplifier will work well as a mobile unit with no more voltage than the 14 volts a car supplies. If you have a 12- to 24-volt DC-to-DC converter, so much the better.

My thanks to Will Payne N4YWK for his encouragement and technical assistance—without his help the project might never have worked. Also, thanks to my XYL, Carolyn KC4NBE, who edited the manuscript.

Parts List

C1, C2, C12	4-38 pF trimmer
C3	56 pF
C4	5-30 pF trimmer
C5	680 pF silver mica
C6	0.01 µF disc ceramic
C7	100 µF 35-volt
C8	0.1 µF chip
C9, C10	500 pF feedthrough
C11	0.01 µF chip
D1	3.5-volt zener
D2, D3, D4, D5	1N4148 high speed switching diodes, Radio Shack 276-1122 or equivalent
L1	2 turns 0.30" i.d. #16 enamel closewound
L2	1-1/4 turn 0.2" i.d. #16 enamel closewound
L3	2 turns 0.30" i.d. #16 enamel closewound
Q1	Motorola MRF 137 or equivalent *
R1, R2	10k 1/4-watt
R3	10k variable
R4	1.8k 1.2-watt
RFC 1	Radio Shack 273-102 100 µH RF choke
RFC 2	20 turns 0.30" i.d. #16 enamel closewound
T1, T2	17-1/2" RG-58/u coax coiled four loops

An etched and drilled PC board is available for $6 + $1.50 shipping/handling per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.
* The Motorola MRF137 is also available for $24 + shipping from RF Parts, Box 700, San Marcos CA 92060. Phone: (800) 737-2787 or (619) 744-0700.

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CT-90 9 DIGIT 600 MHz

CT-125 9 DIGIT 1.2 GHz

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CT-70	20 Hz–550 MHz	< 50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	< 10 mV to 150 MHz < 150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	< 25mV to 50 MHz < 15 mV to 500 MHz < 100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	< 25 mV to 50 MHz < 10 mV to 1 GHz < 50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$249.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	< 50 mV	Convert your existing counter to 1.5 GHz		$89.95

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Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.
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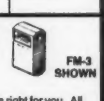

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FM-2, as above but with added mike preamp $7.95
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Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.
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Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.
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AA-7 Kit $24.95
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SS-7 kit $29.95
Matching case & knob set, CSS $12.95

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Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!
FM-10 kit $29.95
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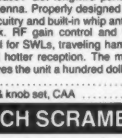

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There's always been a sure-fire way to tell a hard-core ham. He's the one with the expensive wattmeter. A quality wattmeter, with all those elements and the case and everything, can easily cost more than a cheap HF rig. You can be sure that if someone shells out that kind of money for a piece of test equipment, he's really into ham radio.

Fortunately, the people at DAIWA have made owning a quality wattmeter a little easier for the the rest of us non-hard-core types. The DP-800 series of wattmeters sport top-of-the-line features, accuracy equal to the industry standard, and a price that won't blow the ham budget. The DP-810 covers 1.8 to 150 MHz, at 0.1 to 1500W, and has a list price of $265.95. The DP-820 covers 140 to 525 MHz, at 0.01 to 150W, and lists for $295.95. The deluxe DP-830 covers both of the above bands, and throws in a four-time-zone clock, for $385.95. All three units read SWR from 1:1.0 to 1:5.0, and measure PEP as well as average power. The units have a power reading accuracy of 7% of full scale for average readings, and 12% for PEP readings. Readings are displayed on a 2-1/2 digit LCD display. Six AA batteries power the meters, and a power lead is included if you want to power the unit with your own 8-to-15-volt supply.

Photo A. Front view of the DP-830 digital SWR and power meter.

Photo B. The DP-830 happily sitting on a transceiver. Note the simultaneous display of power and SWR. Relative power is also shown by the bar graph.

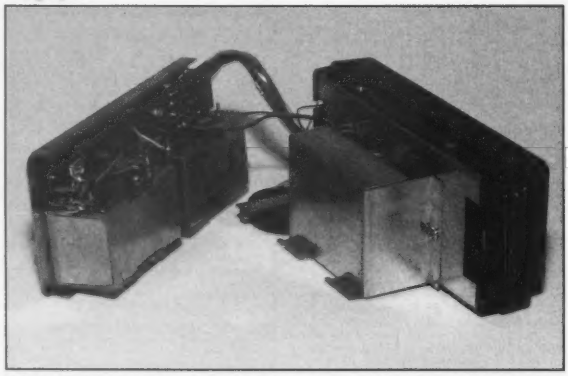

Photo C. Interior view of the DP-830, showing the housings containing the two sensing units, and the battery housing attached to the back of the main board.

Wide Frequency Coverage

The classic problem with wattmeter design concerns the need to use the unit on a wide range of frequencies. This is certainly the case for the radio amateur—even an entry-level ham may find the need for power measurements at 28 MHz and 146 MHz, quite a range in itself. As the frequency increases, the capacitance and inductance inherent in the sampling circuits changes, causing inaccurate readings. This has traditionally been solved in one of two ways. The first method is simply to limit the design frequency of the instrument. As an example, most wattmeters found in the average ham shack are designed for the HF bands, say 2 MHz to 30 MHz. These will be relatively accurate over most of the range, and tend to be a little less than accurate up near 10 meters. The second method involves changeable sensing elements. These elements, often called "slugs," are built for a small band of frequencies. As the frequency of interest is changed, so is the slug, ensuring a correct reading (as long as the correct element is used).

Features

The DP-830 takes somewhat of a combination approach to the problem. It uses two separate sensing elements, one for 1.8 to 150 MHz and one for 140 to 525 MHz. The proper connections to each element are made via the back panel—two "N" connectors for UHF, and two "SO-239" connectors for the HF. Both transmitters can be left hooked up at all times, and a front panel switch selects one element or the other.

Other front panel functions include the TIME selector—tapping this button selects one of four different time zones. Set one to local, one to GMT, one to the buddy you have that sked with, and the last one to . . . ??? Whatever, it's there if you need it. A nice feature of the time function occurs when the unit is hooked up to an external supply. When left in the TIME mode, the unit kicks in to read power as soon as the transmitter is keyed, then switches back to time mode. (One of those

features you're glad that somebody thought of . . .) A BAR GRAPH switch toggles the 15-segment bar graph on and off. An SWR BEEP function causes the unit to beep in different ways, depending on the level of the SWR. Musically-inclined hams will find a chart in the instruction sheet that relates the different SWR levels to the musical notes that will be produced. For example, an SWR of 1.30 equates to three "D sharps" followed by one "E flat." While most of us will use this function only as an ongoing alarm system—anything other than one beep means trouble—this is an extremely valuable feature for sight-impaired operators, or anyone who wants to rapidly tune up an antenna for minimum SWR without having to see the meter. The front panel controls are rounded out with a PEP/AVERAGE switch, a POWER switch, and recessed time set controls.

The physical construction of this unit leaves nothing to be desired. Both RF sensing units are enclosed in metal housings, mounted inside a stylish metal cabinet. Simply picking up the DP-830 is enough to convince you that this is a quality unit. The unit looks good enough to warrant a permanent spot on the operating shelf, but is tough enough to be used mobile, or in a service environment.

Operation

Operation of the DP-830 was very straightforward. Simply pop in the six AA batteries (yes, they're included) hook up the transmitter(s) to the appropriate connectors, set the clock, and you're in business. The unit was well within specification when compared to a lab standard wattmeter. In actual ham shack use the unit performed flawlessly. The bar graph meter was very responsive, and would be quite useful for tune-up operations. The ability to see both forward power and SWR simultaneously is a real plus, although a reflected power reading is not available. The unit autoranges, and perhaps the only feature missing is a "range hold" switch. For those of us who operate right around 150W (the point where the unit switches from W to kW) it would prevent the unit from flopping between 149W and 0.151 kW, and the corresponding change in the bar graph.

The only weak point to the DP-830 concerns the documentation, written both in Japanese and broken English. Considering all of the starving technical writers around, it's amazing that DAIWA didn't hire one to give their manual the once-over before it hit the press. The operation of the DP-830 is mostly self-explanatory, so this is more a matter of mild amusement than serious concern. (However, at one point after changing the batteries my unit "woke up" with no display! Nothing I could think of corrected the problem, so as a last resort I read the instructions. Luckily, I found this passage: "Please push the RESET switch when the any informations are not dis-

Continued on page 63

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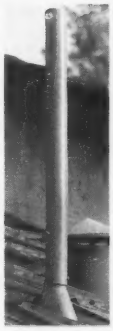

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CIRCLE 228 ON READER SERVICE CARD

A New Look at Loop Antennas

Adding regeneration to ferrite-core and open-wire box loops.

by Ken Cornell W2IMB

Anyone who has used a properly operating regenerative preamplifier can appreciate the tremendous gain, sensitivity and selectivity that it provides their receiver for weak signal detection. Why not apply this principle to a loop antenna?

Due to years of experimental efforts, I had several types of ferrite core and open wire box type loops available. I decided to rework my favorite ferrite core loop to provide regeneration. I wired up a simple regenerative preamplifier on a small piece of perf board and wound some new coils to provide a source tap. The preamplifier circuit is shown in Figure 1. The loop assembly is shown in Figure 2 and it is offered as a suggested design.

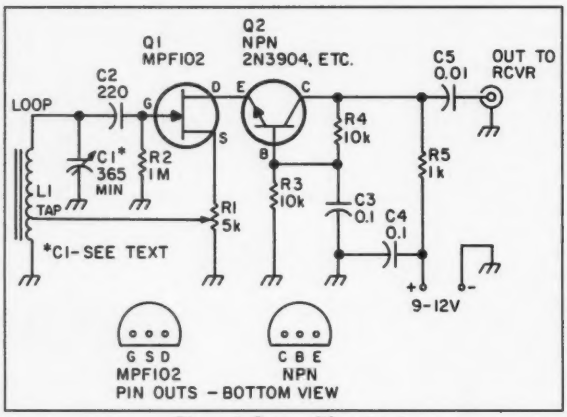


Figure 1. Preamplifier circuit.

I mounted the regeneration control potentiometer with the back shell pressed against the board, using double-sided tape (RS #64-2343). It is not practical to mount the tuning capacitor on the circuit board support so I mounted it on the base disc and connected it to the coil (L1) using a length of RG-59/U coax cable with the shield going to the ground end of the coil and the inner conductor to the gate end.

On the threshold of oscillation, the tuning is extremely sharp and a vernier dial should be used for C1. Another scheme would be to place a 10 to 15 pF variable capacitor across C1, set at half capacity, and use this for fine tuning as well.

Part values are as shown. Capacitors are disc type, 35V. Resistors are 1/8 or 1/4 watt. Potentiometer R1 should have a linear taper.

Of course, L1 and C1 should be a resonant circuit covering the desired frequency range. The number of turns required can be an experimental endeavor, depending on the ferrite core permeability and size. Most ferrite cores have a fairly high permeability (800 or more), therefore operation above 10 MHz is impractical since there would be too few turns on the coil to obtain a reasonable L/C ratio. Above 10 MHz a box wire loop antenna should be used instead of the ferrite rod/coil combination.

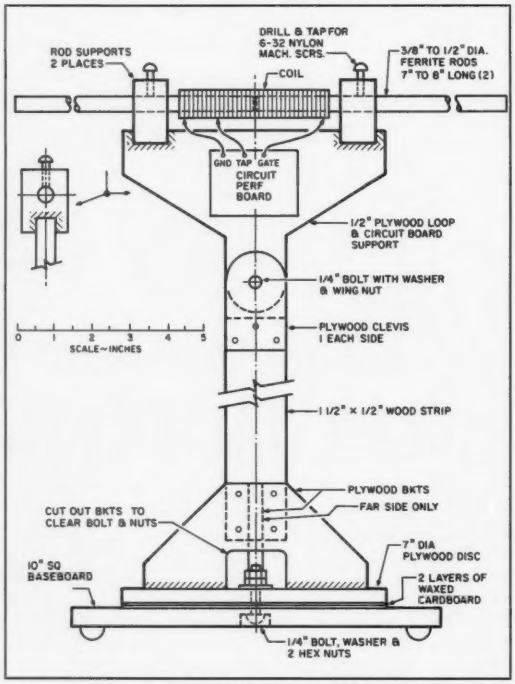


Figure 2. Loop assembly.

Construction

I used 1/2" diameter rods with a permeability of 2,000. I wound my coils on a 5/8" diameter form. Using a two-gang BC band variable capacitor for C1 with the stators in parallel for 160 meters, I wound 45 turns of #28 enameled magnet wire with the source tap at nine turns up from the ground end. The best tap for all coils is about 20% to 25% of the total number of turns: for 80 meters, 25 turns; and for 40 meters, 11 turns, with the wire space at 1/8" between turns.

If you follow the construction shown in Figure 2, I suggest that the two rod supports be clamped together and then drilled for the rods. Then place these on the rods and tape the junction of the two rods to insure proper alignment. Finally, cement the supports to the circuit board support.

The height of the rods over the base should permit swinging the rods to a vertical position without interfering with the base board.

The two layers of waxed cardboard sandwiched between the disc and the base board will allow smooth rotation. The center line bolt with its nuts should be just tight enough to allow for this.

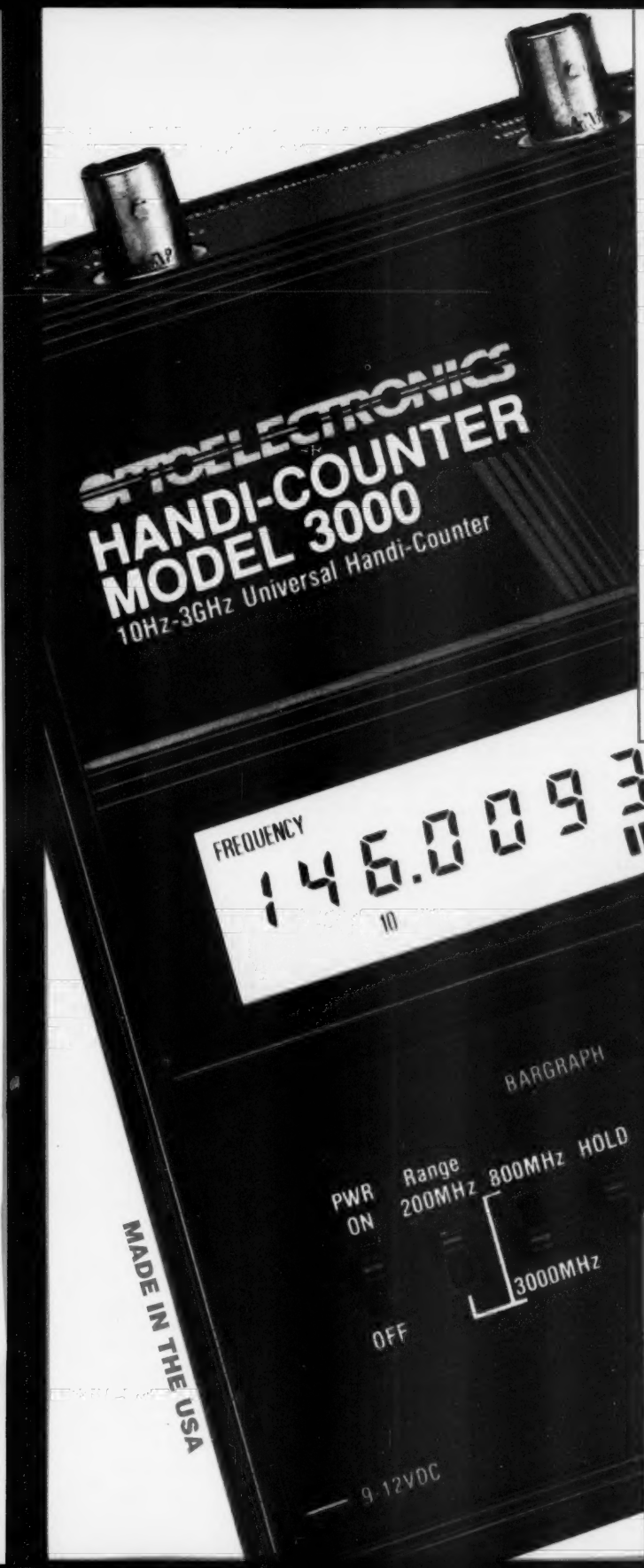
To change coils, loosen the two nylon set screws and withdraw the rods. I used short lengths of flexible wire attached to mini-alligator clips to connect the coil to the circuit board.

In operation, it takes a little practice to become familiar with the features. Place your receiver and preamplifier in operational condition and advance the arm of R1 towards the source end. The circuit should go into oscillation. Turn back the arm and at some midpoint you should hear a weak "plop," then tune in the desired signal and slowly advance the arm back to the source end. Just before the circuit goes back into oscillation, the signal will peak up tremendously and at this point fine tuning is required.

Another much simpler design that I tried out with equal success is shown in Figure 3. In this case the rod is in a fixed position and the whole unit has to be rotated. The unit could be mounted on a camera tripod "pan head" to provide horizontal-to-vertical scanning.

Ferrite core loop antennas are not limited to the use of only one or two rods; in fact,

Continued on page 78



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CIRCLE 172 ON READER SERVICE CARD

73 Review

by Mark T. Schmidt WB9EGA

The Kantronics KPC-3

Full-featured packet in a compact package.

Kantronics Company, Inc.
1202 E. 23rd Street
Lawrence KS 66046
Telephone: (913) 842-7745
Price Class: $120

Kantronics has been in the business almost from the beginning of packet radio and is still going strong. Their KPC-2 has been around for some time now and the software has been updated numerous times. In the beginning there was the basic VHF/HF TNC with Digi. Since then they have added a BBS, KA-Node (their version of node) capabilities, WEFAX and remote control.

Their latest entry is the KPC-2's little brother, the KPC-3. Although the only thing little about it is its size.

Similarities

Features like the PBBS, KA-Node, Host mode, KISS mode, WEFAX and remote access are still there and operate identically to the KPC-2.

The KA-Node has always been a selling point for me and should be for others looking for a node. Unlike other nodes, you don't need to burn another EPROM or buy any updates. All parameters can be set by the user, even remotely.

The addition of remote control operation is a plus. No more special trips to the Digi site to set parameters. You have to be careful not to paint yourself into a corner. Hint: Don't turn EQUALIZE off unless you are certain you can turn it back on again. An unscheduled trip to a mountaintop taught me that one.

I've never had the chance to operate WEFAX. Most amateurs would probably never have a reason to get their own weather map, except for the novelty; however, I could see small Emergency Operation Centers (EOCs) that might want their own current copy during a hurricane alert. PC software is not included but is available from Kantronics. If you feel confident enough to write your own program, Kantronics gives you the specifics. Data comes in too fast (9600 baud) to write it in interpretive BASIC. Kantronics suggests Compiled BASIC, C or even Assembly language (for you masochists).

One more word about the WEFAX mode. I prefer to call it the "signal sampling" mode since all it really does is sample the incoming signal, at intervals set by you, and send a raw bit stream of 1's and 0's based on mark and space tones. I'm able to decode RTTY signals with a simple BASIC program. Although Kantronics says the center frequency is 1700 Hz (where everything higher than that comes out as a "1" and anything lower is a "0"), I've been able to copy 2125/2975 tones on VHF-FM. Experiment with this mode and see if you can come up with a program to decode ASCII and maybe even CW.

Many units use DIP switches to set the RS-232 baud rate, turn the LEDs on and off, etc. I have always liked the idea of software switches instead of hardware DIP switches. It just makes the unit look cleaner and software switches don't get dirty. The KPC-3 retains the software switches.

Connectors are the same: a DB-9 for the radio, a DB-25 for the RS-232 and a 2.1 mm power jack.

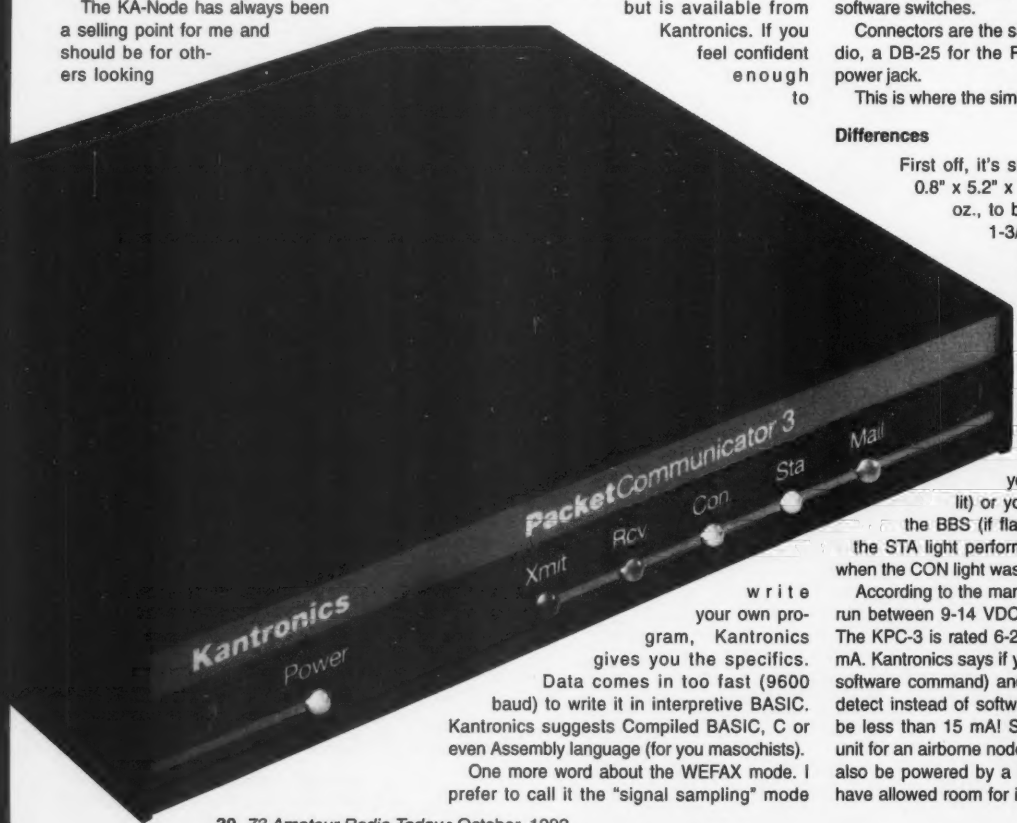
This is where the similarities end.

Differences

First off, it's smaller. Much smaller. 0.8" x 5.2" x 5.2", weighing in at 11 oz., to be exact; compared to 1-3/4" x 6" x 8", at 2-1/4 lbs., for the KPC-2. That's one-quarter the size and one-third the weight!

In addition to the POWER, XMIT, RCV, CON and STA LEDs, they've added a MAIL light to indicate someone is connected to your PBBS (if constantly lit) or you have unread mail in the BBS (if flashing). On the KPC-2, the STA light performed this extra function when the CON light was off (not connected).

According to the manuals, the KPC-2 would run between 9-14 VDC at less than 250 mA. The KPC-3 is rated 6-25 VDC at less than 40 mA. Kantronics says if you turn off the LEDs (a software command) and use hardware carrier detect instead of software detect, current will be less than 15 mA! Sounds like the perfect unit for an airborne node for 24V aircraft. It can also be powered by a 9V battery, which they have allowed room for inside. It's nice to know



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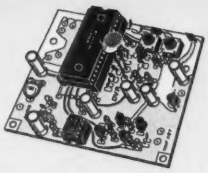

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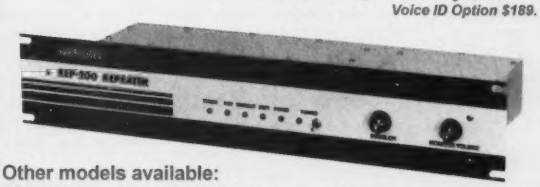

Other models available:

REP-200V Economy Repeater. As above, except uses COR-4 Controller without DTMF control or autopatch. **Kit only $795, w&t $1095.**

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- Cw speed and tone, beep delay, tail timer, and courtesy beep type **can be changed at any time** by owner password protected dtmf commands.
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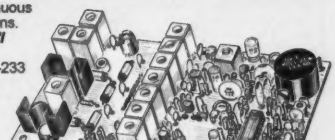

- **TA51**: 50-54, 143-174, 213-233 MHz ...kit $109, w&t $189.
- **TA451**: 420-475 MHz ...kit $109, w&t $189.
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you have something to fall back on in an emergency, but don't expect it to last for days. This battery is disconnected when you plug in the power on the back. The 9V battery connector is NOT installed and is NOT included loose. In the manual, they do give Radio Shack as a source and directions on where to solder it to the board.

Parameters are no longer PERMed into an EEPROM. A lithium battery now backs up a SRAM (including the mailbox) and keeps the clock going.

The AFSK output level on the KPC-2 could be changed by moving a jumper between a HI (21 mV) and a LOW (4.5 mV) position. Other levels can be had by changing a resistor. In the KPC-3, two ranges are available and are set by a jumper: 2 mV to 60 mV, or 140 mV to 4V. Adjustments within the range are done with a pot, though you must take off the cover to get to it.

Kantronics has designed in the option of installing a real-time clock. They say it's only used when the unit is first powered up. You can go ahead and put one in if you want, but now that I can control everything remotely, including resetting the time, I don't think it's really necessary.

The KPC-2 has HF capability but without some kind of tuning indicator, it's a chore. HF capability on the KPC-3 is gone but probably won't be missed anyway since many more are used on VHF than on HF. Although HBAUD can be set down to 300, the 1200/2200 Hz tones remain the same. There is a simple mod to change it to 1300/2100 Hz if needed.

The early KPC-2s were delivered with 16K expandable to 32K. After a while, 32K became the standard. But after configuring 5-node channels it leaves only 3K for a BBS. Memory in the KPC-3 comes with 32K but can be increased to 128K or 512K. Kantronics acknowledges that there is yet no supplier of 512K x 8 memory chips, but when there is, the "3" is ready. This should free up many computers dedicated solely as BBS's.

Ever want some kind of quick reference sheet to tell you in one line what a command does? Well, they don't have a printed sheet—they've gone one step further and put it online. At the command prompt, type a "?" or "HELP," followed by the parameter. Example: "?MCON" told me, "If on, allows monitoring to continue while connected;" and "HELP AXDELAY" said, "Time delay between PTT and radio data out (10 msec)". If you still must have hard copy, turn on your printer and type "?HELP." This will print out all commands and their one-line explanation.

A 2.5-minute Watchdog timer is standard. Although I've never had a TNC lock up on me since version 1.0, it's better to be on the safe side. It can be disabled by installing a jumper.

Some hand-held radios combine the PTT and MIC signals onto one line. Cables had to be wired to separate the signals and send them down two different lines. In the KPC-2 and KPC-3 there is an isolation modification you can make to have the TNC take the PTT signal off the MIC line for you. In the KPC-2, this involves cutting a jumper wire and soldering a new jumper to a different position. Somewhat permanent. The KPC-3 has the same sort of thing but makes it a little more flexible by providing jumper posts and a plastic connector. It just slips on and off. If you use one of these HTs exclusively, this may be something worth looking into since it simplifies cable wiring. But if you jump back and forth between different radios, this may not be very convenient. I prefer to have a cable made for each radio I have. The single resistor and capacitor needed for isolation fit easily inside the DB-9 hood.

The serial port on the KPC-2 could be configured to provide normal RS-232 signal levels or TTL levels for computers that need it, like the Commodore C-64, C-128 or VIC-20. The KPC-3 provides RS-232 levels only.

The Manual

My KPC-2 came with an "Installation Manual," "Operations Manual" and "Commands Manual" in an 8-1/2" x 11" format. They actually covered the KAM, KPC-4, KPC-2400 and KPC-1 along with the KPC-2. It took a binder to hold it all. If you take out the parts that pertain only to the KPC-2 and make it smaller (about 6-3/4" x 8-1/5" would be good) for easier storage, you would have the KPC-3's "Reference Manual." Portable operators will find it more convenient. Beginners to packet radio might find the manual (or anybody's manual, for that matter) somewhat intimidating. After all, there are 130+ commands. How are you supposed to know which ones are important now and which ones you can play with later? For you they've printed a "Getting Started" booklet. It shows 23 basic commands to get you up and running and cable wiring diagrams for eight of the more common radios.

Just about any terminal software will work with this TNC but if you have none, they've included one for you. "Pacterm" comes on a 5-1/4" disk and is easy to use. It's not the most elaborate software, but it works. It appears it was designed for the KAM since there are more options available than you need. All instructions are in the "Getting Started" booklet.

Suggestions

It's hard to find fault with this unit, but if I had to pick something I would choose the lack of a power supply. One came with the KPC-2 but not with the KPC-3. I know it can operate on the internal 9V battery, but not forever. This may be a minor inconvenience for many users, but I had to pick something. Also, it would be nice if they included the 9V battery connector, too.

Accessories

The KPC-3 comes with the two manuals, the Pacterm program, a DB-9 connector with metalized hood, five-conductor shielded cable, a mini-plug cable and a 2.1mm power plug.

Likely Users

Who should take a close look at the KPC-3?

Portable users: The smaller size and lower power requirements are a definite advantage. With a handful of 9V batteries you could operate for quite some time.

Node operators: Increased memory gives you more channels. I've always been somewhat reluctant about using a full-blown KPC-2 as a node when I wasn't using all the features it had to offer, like HF. Remote operation capability will save you trips to the site for any parameter changes. Also, the KPC-3's price is about $50 lower than the KPC-2. This makes leaving it on a mountaintop a little more palatable.

BBS operators: For many applications, this might be all you need. Dedicated BBS computers can be put to use elsewhere. If you kept your station up because you needed your own PBBS, you might not now. Your local node can serve as everyone's PBBS.

Emergency services: Search and Rescue organizations, like the Civil Air Patrol, often operate from field locations on auxiliary power. The less you have to transport the better. Don't forget the instant high capacity BBS.

Conclusion

Don't let the KPC-3's small size fool you. On VHF, it will do everything the KPC-2 does. Dollar for dollar and feature for feature, I don't think you'll find a better TNC. I think Kantronics has another winner here. 73

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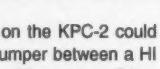

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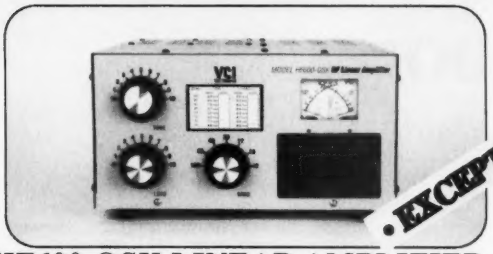

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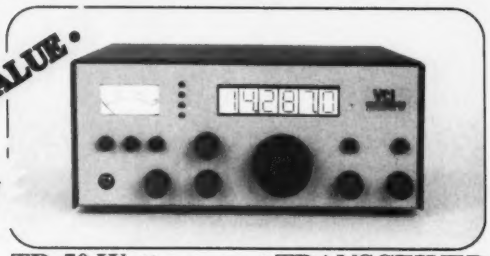

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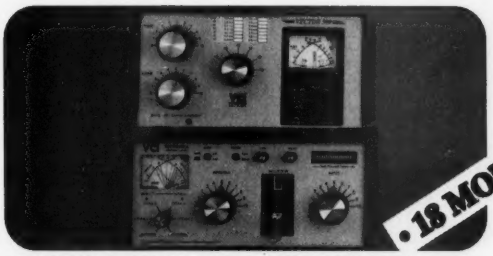

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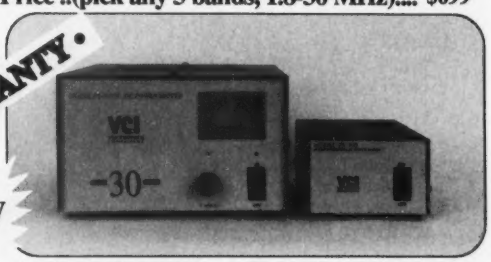

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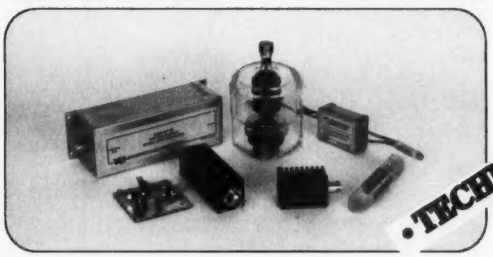

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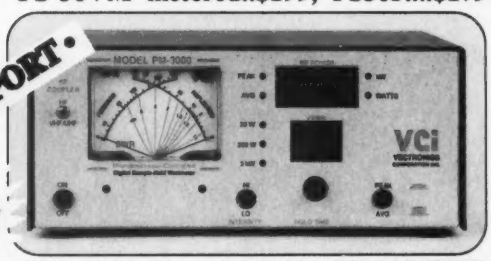

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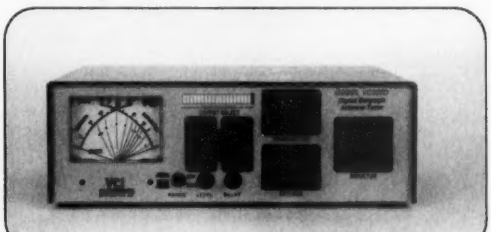

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Baby Loopy

A half-wave, inductively-loaded loop.

by Dean Frazier NH6XK

Did you ever experiment with a half-wave loop in the horizontal plane, loaded at the 1/4 and 3/4 points? They're easy to make, and give you 3 to 6 dB gain and about 20 dB side rejection by reducing the current in the sides. This results in greater current across the antenna along a line from the side opposite the feed point, through the feed point. They are ideal for beaming in a fixed direction, and on the higher frequencies they can be made so small that rotatability is entirely feasible. They mount easily on a rooftop. I've worked with them from 10 through 40 meters and without exception have had very good results, compared with my R5 vertical and 414-foot longwire. With this background in mind, my purpose in this article is to show you how to design and set up your own "Baby Loopy."

Note: The loop is physically smaller than it would be as a half-wave antenna because a portion of the half wave's wire is used as loading coils. The loop is physically, not electrically, smaller. See Figure 1.

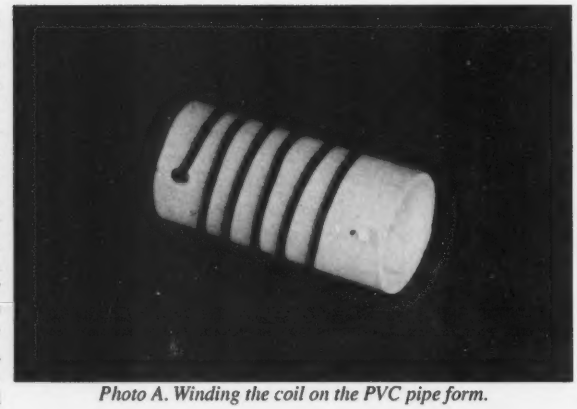

Photo A. Winding the coil on the PVC pipe form.

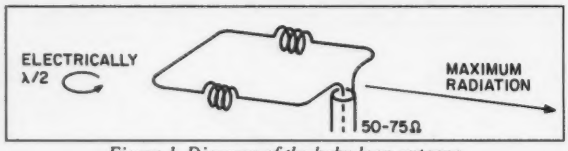

Figure 1. Diagram of the baby loop antenna.

Construction

To figure the amount of wire (feet) needed for the half-wave loop, calculate as follows:

$$\frac{\lambda}{2} = \frac{1005}{2(f\ \text{MHz})}$$

Example: $\frac{\lambda}{2}$ loop for 40 meters (7.2 MHz):

$$\frac{\lambda}{2} = \frac{1005}{2\ (7.2)} = 69.79\ \text{feet}$$

The 1/4 point (e.g., the center of the first coil) will be, measured from the feedpoint, 69.79/4 = 17.45 feet, and the 3/4 point (the center of the other coil, again, as measured from the feedpoint in the same direction) will be 3/4 x 69.79 = 52.34 feet. The center of the second coil should come out at 17.45 feet from the feedpoint, as measured in the opposite sense as the first coil was measured. See Figure 2.

Now, to achieve the gain and side rejection, we need to introduce about 360 ohms of inductive loading by coiling the wire at the 1/4 and 3/4 points on the wire:

$X_L = 2\pi fL$ where X_L = Inductive reactance (ohms), $\pi = 3.14$ and f = frequency, (MHz)

$360\Omega = 2\ \pi(7.2)L$

$L = 360/2\ \pi(7.2) = 7.96\ \mu H$

Recall that for an air-wound coil, the following formula shows the connection between the coil diameter, "d" (in inches); the number of coil turns, "n;" the length of coil when wound, "ℓ" (in inches); and the inductance, "L," in microhenries:

$$L = \frac{d^2\ n^2}{18d + 40\ell}$$

Solving this equation for "n," the number of turns, yields:

$$n = \frac{\sqrt{L\ (18d + 40\ell)}}{d}$$

If, for example, we happen to have two-inch PVC pipe on hand on which to wind the coils, we calculate the number of turns required, "n," by estimating an appropriate coil length, "l":

$l \approx 4$ inches estimated

If, again for example, after some trial and error, we decide on a length of coil of 3-5/8 inch, we find about 19 turns of wire will give the desired inductance:

$$n = \frac{\sqrt{7.96\ [18\ (2) + 40\ (3.625)]}}{2} =$$

$18.98 \approx 19$ turns

($3\ ^5/_8$ inch = 3.625)

By varying "l" we change "n," for a given (fixed) "L" and "d." We try to juggle "l" so that "n" comes out as a whole number, which is convenient to wind.

We have to check that in fact this many turns of wire will fit physically into a length of 3-5/8 inch. I find that keeping the number of turns of coil down to six or less per inch seems to work well.

$$\frac{18.98}{3.625} = 5.24\ \text{turns per inch}$$

Having passed this test, we realize that our coil will look like Figure 3. Now the question becomes, how much wire did we "use up" in winding the coils? The wire used per coil, in feet, is:

$$\frac{19\ \text{turns}\ (3.14)^2}{12\ \text{inches/ft.}} = 9.94\ \text{feet}$$

For 2 coils, this amounts to 19.88 feet.

The balance of wire in the antenna is 69.79 - 19.88 = 49.91 feet. Dividing this remaining wire into two halves, one half for the "front" and the other half for the "rear" of the antenna, we get a picture of our loop as shown in Figure 4.

Mount the loop horizontally. The maximum radiation as shown above is from the far side of the loop back towards the feed point. Run the feedline away from the loop perpendicular to the plane of the loop for at least a quarter wavelength.

Comment on winding the coils: Spot the

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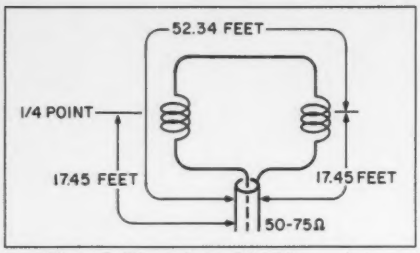

Figure 2. Dimensions of the 40m version.

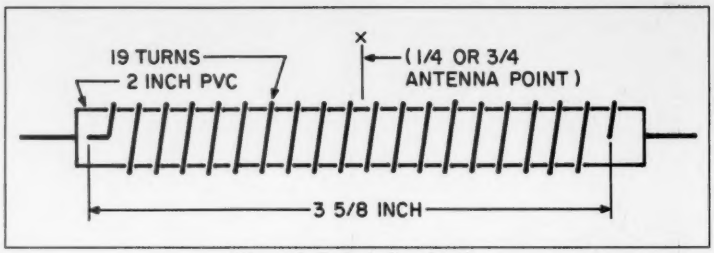

Figure 3. Coil winding details.

1/4 point (and again the 3/4 point) of the wire loop at the center of your coil form(s) and wind the coils in both directions onto the form to ensure that, when wound, the 1/4 point and 3/4 points on the antenna are, in fact, *exactly* at the center of the coils.

Comment on installation: The usual rules about installation apply. I've put my Baby Loops on the non-metallic roof of my QTH with barely a few inches clearance. My 12 meter Loopy faces ZL (from Hawaii) and I consistently receive reports one to two "S" units stronger in the desired direction, compared to my R5 (which, by the way, is a very effective antenna in its own right on 10 through 20 meters, including the WARC bands). The same loop gets me into the continental US, so evidently there is some side and high angle radiation.

Note that a half-wave loop for 40 meters will tune 10 and 20 meters as two- and one-full-wave loops respectively, with a preponderance of perpendicular (to the loop plane) radiation, and as multiples of a half-wave (in the plane) on 17, 15, and 12 meters. The former capability is useful for "short haul" (out to 2,500 miles) high angle radiation, while the latter shines on DX (low angle, long distance).

Regarding the Baby Loopy's size, as more wire is wound into the coils less is available for the remainder of the loop, resulting in a physically smaller and smaller loop. There will be some practicable limit to size reduction as a function of radiation efficiency, but I have yet to find that limit. (We're alluding here to a transition from use of the electric vector to the magnetic vector for radiation). My experience with the half-wave loops from 10 meters through 40 meters is that almost any size which is comfortable to build will work, as long as the inductive reactance of the coils is around 360 ohms. Varying the loop's physical size will of course alter the radiation pattern, which can best be modeled via computer program. Of direct concern to the amateur, however, is the resulting feed point impedance variation with change in loop size. However, the usual impedance matching methods apply (balun, series section transformer, etc.). A good ATU is the easy way out. Personally, I use nothing more than an L/C "Random Wire" tuner feeding coax to the loop.

So, if you have limited space, are unable to put up mega-arrays of antennas, and for whatever reason must erect low profile antennas, then the half-wave inductively loaded horizontal "Baby Loopy" may just be the answer. You'll realize gain, directionality, and some front-to-back and side rejection. They're easy to make, easy to install, and easy to tune. They work.

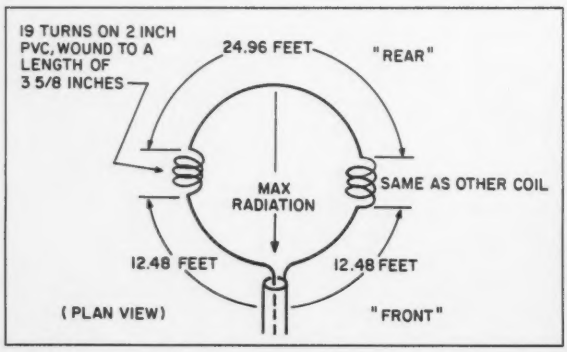

Figure 4. The baby loop can be thought of having a "front" and "rear" as shown.

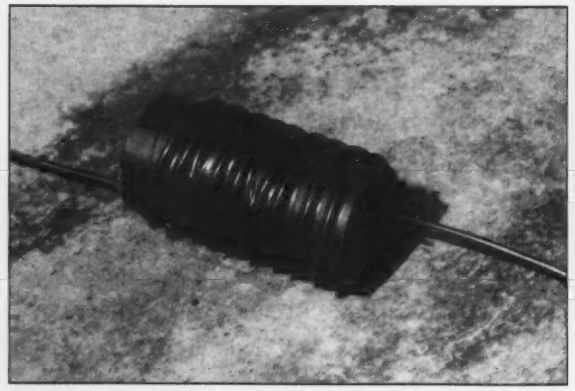

Photo B. A completed coil, wrapped in black vinyl electrical tape to hold the coils in place.

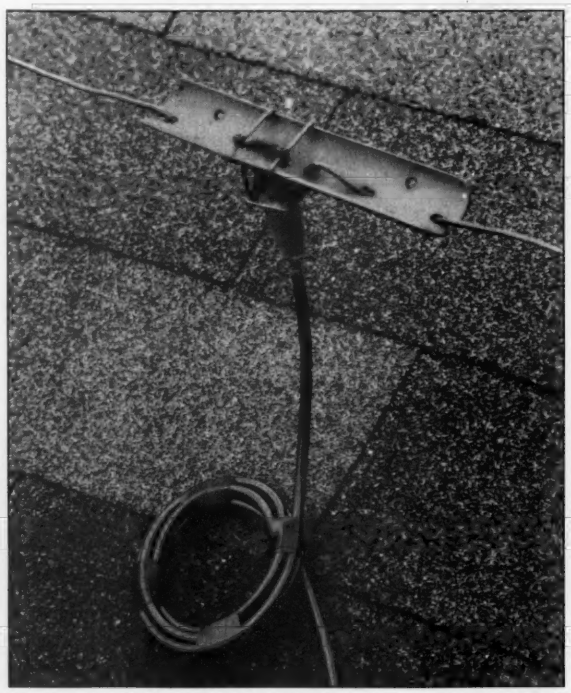

Photo C. The feed point of the baby loop antenna. A strip of PVC pipe (cut down the middle) was used to mount a SO-239 female connector and to support the antenna wire. Note also an RF air balun (1:1) formed out of coils of the feedline.

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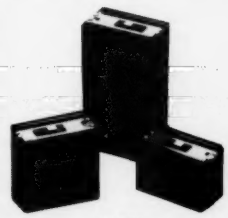

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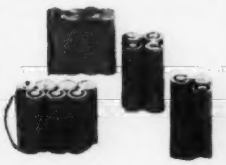

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Noise Reduction Using Broadband Active Whip Antennas

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by D. F. Curry WD4PLI/6

Active whip antennas can be used successfully in a number of applications where man-made noise such as light dimmers, power line hash, TV horizontal oscillators and other types must be reduced or eliminated in the LF/VLF spectrum.

The technique involves the use of two active whip antennas, both electrically identical but physically placed in a manner that allows phase cancellation of the noise, while allowing the signal to remain undisturbed. Similar systems have been developed (about the same time as my design), as noted in an exemplary article by Dave Robinson, "Active Wideband Interferometer Using Active Whips," featured in *Lowdown*, August 1990.

My particular requirement was the elimination of power line hash from a nearby high tension line. Noise blankers are effective for removing impulse noise with high amplitude spikes, but a poor choice when trying to remove "complex" noise such as power line hash that typically masks itself as the final word on your S-meter.

This circuit not only phase-canceled the power line hash but as an extra bonus substantially reduced the neighbors' TV horizontal oscillator harmonic, rendering another portion of the 1750 meter band usable. Figure 1 shows the basic block diagram of the two whip antennas and the phasing unit, along with the other equipment I used.

Keep in mind that this addition to any receiving station should be part of a "receiving system" that incorporates other beneficial receiving aids such as receiving processors and regenerative preamplifiers. The phasing unit will allow accurate adjustment of phase and amplitude of both signals independently. High quality active whip components can be purchased from manufacturers listed at the end of this article, or built from scratch using the circuit shown in Figure 2. The completed layout for the active antenna preamplifier and the phase shifter is shown in Figures 4 and 5. The PC boards shown in Figures 4 and 5 are available from Curry Communications (see the Parts List for details). The active antenna circuit boards are housed in small Hammond die-cast aluminum boxes for weatherproofing.

For the signal antenna, an SO-239 connector is used for the physical support and electrical connections to the wood mast and the steel CB whip. The "L" bracket is a common CB accessory, found at Radio Shack or other electronic stores.

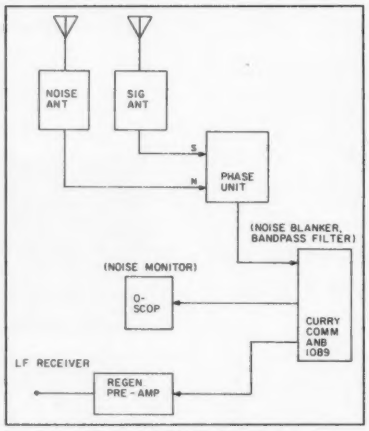

Figure 1. Block diagram.

The noise antenna can use either wire (for low profile) or aluminum rod antennas (as shown) for more rugged installations. Both work very well. If you use the rod version I recommend using two or three rods, approximately three feet long each. Flatten and drill the ends so they can be physically joined to a feed-through connection.

Connect equal lengths of coax to each preamplifier, using BNC connectors. After final installation and an operational check, spray the boxes and connections with a quality marine varnish.

The actual location for active antennas such as these is critical; sometimes the difference of only a few feet from nearby objects can make or break reception. The strategy behind experimenting with antenna placement is to find the lowest noise area possible *before* you begin the phase-canceling scenario.

The lowest noise spot at my location ended up being in the front yard, away from the house and power lines. Also, a separate ground system should be used for active antennas to eliminate ground loops and extraneous coupling of noise from power line related ground systems in the shack. The copper pipe used as the ground rod also supports the wood mast. The braid of each coax cable is connected to the ground rod. The noise is typically installed only a foot or two above the ground.

Phase Shifter

Figure 3 shows the phase-shift schematic, with input T1 and T2 used as isolation transformers to accomplish the necessary separation for the "house" and antenna ground systems. Switch SW1 A-D is an on/off switch and battery charge switch all in one. Please note that the switch, the batteries, and R17/R18 are not mounted on the circuit board, but wired separately. Also note the polarity of B1 and B2 wired to points E and F on the circuit board ground.

Points A-D are jumpers from the circuit board to SW1. Switch SW2 can change the input phase 180 degrees if required. R1 and R2 are load resistors after the voltage step-up transformers T1 and T2, providing an honest to god 50 ohm match at inputs J1 and J2. U1a and U2a are simple broadband amplifiers, with an amplification of 3.1 for buffering and overcoming some losses in the circuit. R7 and R8 are the volume or amplitude adjustment controls, which set the level to the phase-shifting stages, U1b and U2b. The phase-shift circuit is your classic "all pass" variety—it varies the phase from 0 to almost 180 degrees by controlling the potentiometers R11 and R12. R11 is used as a coarse adjustment while R12 is for fine tuning. Output from U1b and U2b is matched to the 50 ohm receiving port at J3 through R15 and R16 and phase shift transformer T3, an audio transformer that places the output signals from U1 and U2 180 degrees out of phase. This output from T3 is connected to your next stage, or your receiver.

Excellent nulls of 70 dB or better have been measured from 50 to 450 kHz using a signal generator as the common input source to J1 and J2, and an oscilloscope monitoring the output. Separate 9-volt batteries are used to power the phase shifter and active antennas. Using a 4PDT switch, rechargeable batteries can be recharged when the phase unit

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IC-4SRA 440/25-905 rx	579.00	**489.95**
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IC-4GAT 440MHz/TTP	399.00	**329.95**
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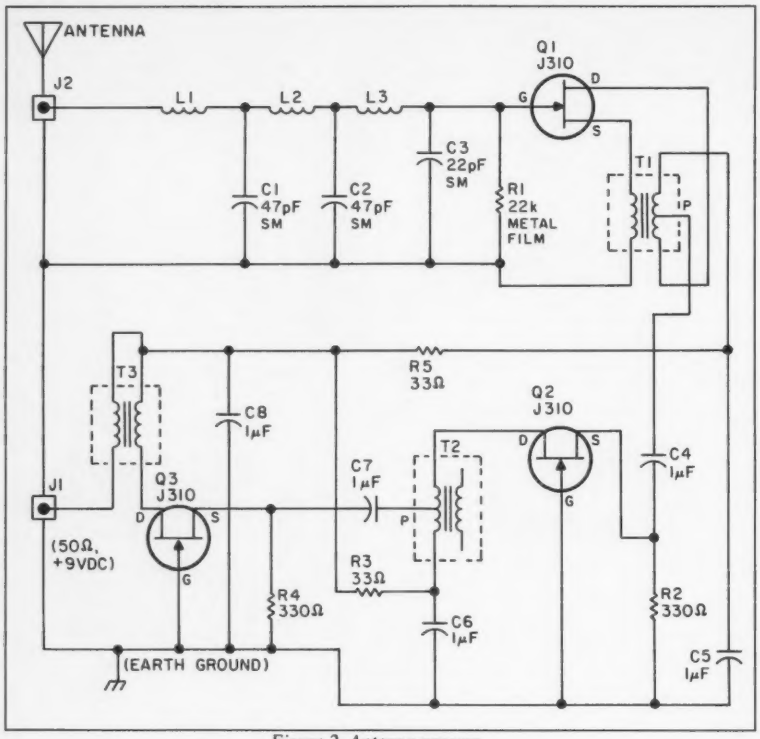


Figure 2. Antenna preamp.

PHASE UNIT PARTS LIST

B1-4	9 volt rechargeable batteries
C1, 4	680 pF Monolithic capacitor (or silver mica)
C2, 3, 5	1 μF monolithic 50 VDC capacitor
J1-3	BNC female chassis connectors
R1, 2	1.2k ohm 1/4 watt resistor Metal film recommended
R3, 4	470 ohm 1/4 watt resistor Metal film recommended
R5, 6	1k ohm 1/4 watt resistor
R7, 8	1k ohm 1/8 watt potentiometer, Mouser #31CX301
R9,10,13,14	2K ohm 1/4 watt resistors (metal film recommended)
R11	25K ohm 3/4 watt potentiometers, 20-turn Mouser #594-43P203. Also order cover, Mouser #594-612.
R12	5k ohm 3/4 watt potentiometer, 20-turn Mouser #594-43P502. Also order cover, Mouser #594-612.
R15, 16	600 ohm 1/4 watt resistor (metal film recommended)
R17, 18	Current limiting resistors, typically 620 ohms 1 watt for R17, and 150 ohms 1/4 watt for R18.
SW1	4PDT switch
SW2	DPDT switch, PC mount
T1-3	Mouser #42TL004. Note the "P" on the transformer, indicating the primary side.
U1, 2	TL072P low noise op amp

WHIP ANTENNA PREAMP PARTS LIST

C1, 2	47 pF silver mica
C3	22 pF silver mica
C4-8	1 μF monolithic chip/50 VDC
J1	BNC chassis female connector
J2	SO-239 chassis female connector
Q1-3	J310 low noise JFET
R1	22k ohm 1/4 watt resistor (metal film recommended)
R2, 4	330 ohm 1/4 watt resistor
R3, 5	33 ohm 1/4 watt resistor
T1-3	Mouser 42TL004 transformer, Note "P" for primary
L1-L3	J.W. Miller 70F823AI iron-core only
Box	Hammond 1590A (Available at Mouser #546-1590A)

Complete kits containing all components and PC boards are available from Curry Communications, 852 N. Lima St., Burbank CA 91505: The Phase Unit kit is $48 and the Antenna Preamp kit is also $48.00. Blank etched and drilled PC boards are available separately from Far Circuits, 18N640 Field Court, Dundee, IL 60118; the Antenna Preamp board is $3 and the Phase Unit board is $4. *Order L1-L3 directly from J.W. Miller at (213) 537-5200.

is off. Note the jumpers on the circuit board, points AA and BB. The phase unit circuit board can be made from the positive in Figure 5.

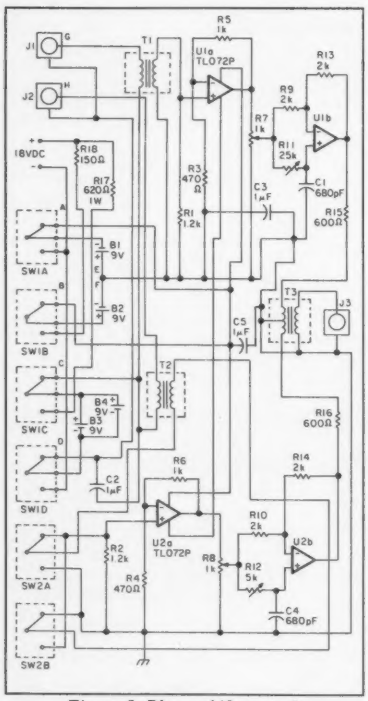
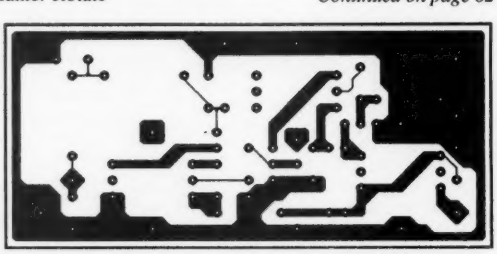


Figure 3. Phase-shift control.

Operation

Apply power to the phase shifter and antennas. The volume controls should be adjusted and reception confirmed. Adjust your receiver to a beacon or signal that you are familiar with, if possible. The volume setting of the SIGNAL channel should be about 3/4 to maximum, and the NOISE channel should be approximately the same. Rotate the FINE adjust phase-shift control to almost fully counterclockwise, and the COARSE phase-shift control adjusted while monitoring the noise floor. SW1 may also be switched for the correct phase input. The best results occur when the phase and amplitude of the noise of each channel is the same, and then canceled by T3. If you are unsure whether the channels are working correctly, a simple check can be done by connecting a single antenna or signal generator to BOTH inputs to confirm actual operation of the phase unit. With

Continued on page 62



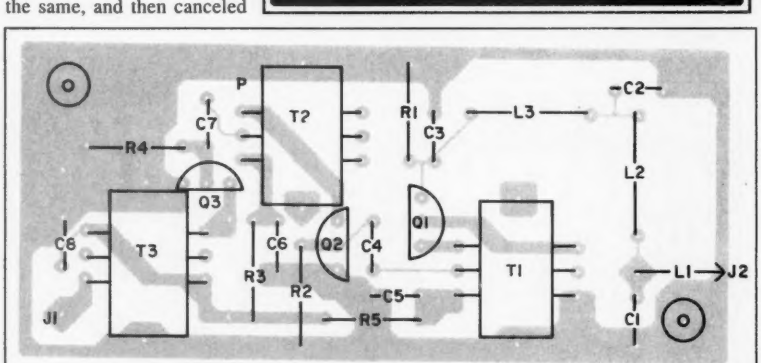
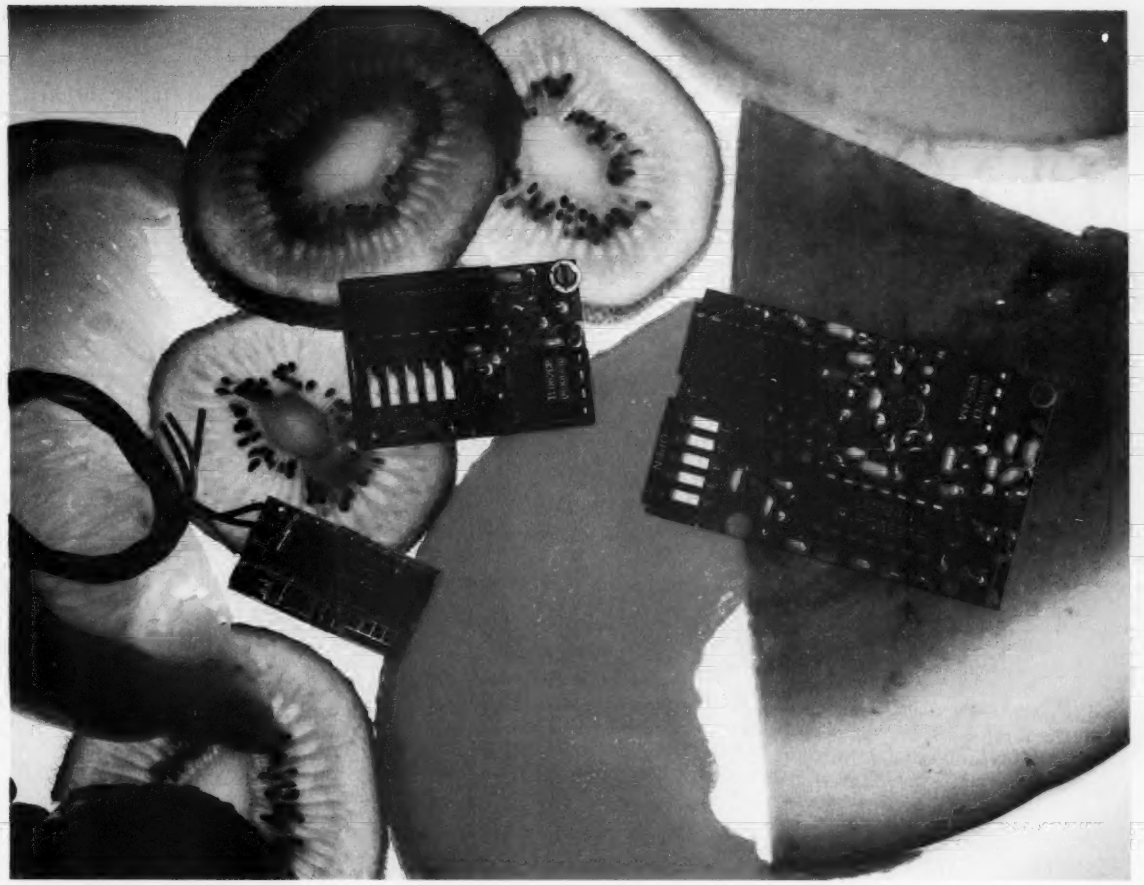


Figure 4.(a). PC board foil pattern for the antenna preamp. (b). Parts placement.



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Packet Radio and Emergency Communications

Public safety enters the digital world.

by Richard Ferguson KAØDXM

Do you want to have a successful ham radio emergency group? This article describes how our group of hams in Boulder, Colorado, progressed from being an ordinary emergency group to a statewide example of what hams could achieve. Before, we were on the outside during emergencies; now we are an integral part of the countywide emergency plan. Packet radio can become your key to being accepted by public safety agencies. Our operational procedures and equipment are also explained, as they have been refined through three major forest fires.

Photo A. One of the portable packet stations operating in the mountains near Boulder. (L to R): Al Beu WAØLMQ, Tim Groat KRØU, Ed Cole WBØSUT and George Becker. Photo by David Fetter KA3HBK.

A Little History

After a major flood in the mid-1970s, a local ham radio emergency group was formed. Boulder County Amateur Radio Emergency Services (BCARES) was active for a number of years but fell into dormancy by the mid-1980s. We were like many ham emergency groups: We had an army surplus communications van with lots of radios, but we were rarely called to serve. If volunteers are never used, they eventually lose interest.

Two things happened to change this. First, BCARES convinced the county communications center that packet radio might be useful. Second, Boulder County suffered a major forest fire. We obtained grants from IBM and the federal government for a demonstration packet radio system in a suitcase, using a Radio Shack Model 100 portable computer, a battery-powered printer, a TNC (terminal node controller or radio modem) and an ICOM IC-2 2 meter radio. The system was somewhat crude, but it worked.

Actually, two forest fires burned at the same time, stretching all local resources, including communications, to the limit. In one day, hams were able to set up three packet stations and one portable digipeater. One station was established at the county communications center, and two stations at the fire command centers, near the fire lines. The county was very impressed with the speedy delivery of hard copy, the relative security of the messages, and the hams' flexibility.

Of course there were problems with packet radio at these first fires, lots of problems: batteries went dead, systems stopped working, radio contact was noisy, etc. Luckily, ham ingenuity solved or worked around the difficulties and the system was used for several days, with only occasional periods "off the air." When the packet system was down or overloaded, messages were handled by voice on a 2 meter repeater.

After the 1988 fire, and every succeeding emergency, we had a critique and figured out what we needed to improve. We held exercises, some of which were disasters in themselves! As a result, we rewrote the ham radio emergency plan for Boulder County. In the 1989 forest fire, which destroyed 40 homes, things went more smoothly and BCARES became accepted as a key element in emergency planning. Packet radio is now written into the county flood and fire plans: BCARES is to be paged automatically when a situation reaches the critical point. At the start of the most recent forest fire, the county radio dispatchers were visibly relieved when BCARES arrived because we take a lot of the traffic load away from the public safety radio channels.

The Old Stage Road Forest Fire

Perhaps the best way to explain how BCARES operates is to tell the story of one emergency from beginning to end. This is the story of our third major forest fire, which burned a dozen houses in Boulder County in November 1990. It started early on a Saturday morning. The first that BCARES knew of it was when a sheriff's officer knocked on the door of one of our members and asked him to evacuate his home. This member called the head of BCARES, who began a callout in the middle of the night, anticipating the need. Soon after, we were paged by the county communications center, which requested packet links from the communications center to the fire base and the evacuation center. A voice net was set up on a local 2 meter repeater.

The Red Cross requested help at two additional locations. For the first time we had enough equipment to set up packet at all sites, so we decided to operate with one voice coordination frequency and all five packet stations connected to the same packet bulletin board. (In past emergencies, the hams serving the Red Cross had handled traffic by voice on a separate frequency).

During the two days of the fire a total of 225 messages were sent via packet radio. Forty-eight hams participated, putting in a total of 350 hours of volunteer time.

One new area that BCARES is beginning to exploit is ham fast-scan TV. In the Old Stage fire, a TV transmitter was set up on top of a hill, giving an overall view of the fire. For the first time, the dispatch center could actually see what was going on, rather than just imagine it through radio traffic. They loved it! On the second day, the fire base requested a receiver too; they were too close to the fire to get the big picture!

Organizing the Hams

A key to success is having several experienced people at the net control site. Our experience is that one ham alone cannot do a good job of coordinating an operation; it is much better to have one ham at the mike and one in the background, thinking. This also means a smooth transfer when the ham at the mike needs to take a break. When most of the traffic is handled by packet, the voice frequency is relatively quiet, and the net control usually does not have to work too hard after things are running.

In a major event with multiple sites, coordinating people is a big job, too big for one person to do well. We have certain people preassigned to key sites and to management of personnel. We use six-hour shifts, based on a survey of our members' preferences. This allows people to work a half day and help with the emergency, too. We generally assign three hams to each site. This provides one person for voice, one for packet, and one to deliver

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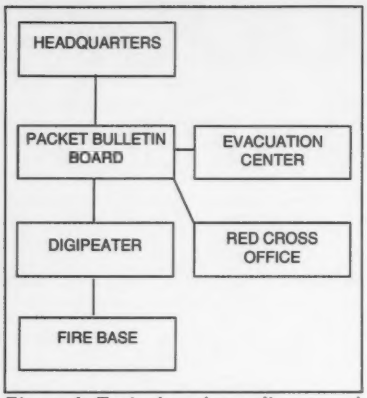


Figure 1. Typical packet radio network block diagram.

messages or provide relief. One of these three hams is the team leader for that site.

BCARES has a list of 50 official members, plus a list of other people upon whom we can count. We assign the most experienced members to key sites and key jobs, then fill out the staffing with others. We often accept volunteers who we do not know, but pair each with a ham who is experienced in our procedures.

Most of the hams are assigned by telephone, but we usually monitor a 2 meter frequency as well. At 9 p.m. each night, a net is run to finalize assignments for the following day. The staffing frequency is different than the operational frequency. People asking questions or sharing information are referred to the staffing frequency in order to keep the operational frequency clear.

Packet and Message Handling

Do not forget these traffic handling basics: Every message needs a number, an addressee, a destination and a signature. The sender's signature is perhaps the most important item. The sender's title and agency should be included with the name. We have developed a standard message format, and packet's error checking features make word count unnecessary for local communications.

The basic procedure at each site is simple. When a ham receives a written message, he checks it to make sure it is signed, addressed and legible. Then he SENDs the message to the appropriate site, typing it directly (via packet radio) into the bulletin board. When the message is finished, the other station receives a one-line notice of mail, then READs the message. After receiving the message, the station acknowledges by voice, i.e. "Fire base, this is dispatch, acknowledging your message 123." The acknowledgement is accepted with a "Thank you," and the message is torn off the printer and delivered. We use tactical calls, such as "fire base," rather than ham calls, on both voice and packet. This minimizes confusion when the ham at the fire base mike takes a break or goes home.

Why Is Packet Successful?

The most important fact is that all of the agencies that we serve like the hard copy messages. The police and fire departments have voice communications, but hard copy from point to point is something else. Packet's automatic error checking also provides protection against garbled messages. In most instances, receiving a computer-printed message is much better than trying to interpret cryptic notations scrawled on cards. Most of the traffic that BCARES handles relates to logistics. (i.e. "Please send 50 shovels." or "We need 35 meals at the fire base at 5 p.m.") In addition to providing hard copy, we provide additional communications operators, as well as additional frequencies.

Packet Hardware and Software

Our present packet system consists of four parts: portable packet systems, fixed packet systems, mountaintop digipeaters and a packet bulletin board.

The portable packet systems consist of a Toshiba T-1000 laptop MS-DOS computer, two ICOM IC-228 2 meter transceivers (one for packet and one for voice), a TNC, a battery-powered thermal printer, a 20 amp-hour lead-acid gel-type battery, a battery charger, and antennas. To keep this from being a back-breaking load, it is divided into two suitcases, plus beam antennas.

The fixed packet systems are standard MS-DOS computers, but with a TNC and a 2 meter radio. These computers are available for general use in the dispatch center or other area, but can be switched rapidly to be used as packet stations when needed.

The software that we use on the fixed and portable computers is Pak-Comm, by Kalt and Associates. However, we generally use the computers as "dumb terminals" with printers because most of the "smarts" are in the bulletin board.

We also use mountaintop digipeaters to provide coverage to remote areas of the county. We are now upgrading these digipeaters with ICOM IC-228 radios.

The bulletin board uses a 150 watt radio at a hilltop site, and an MS-DOS XT-type computer. The TNC is an internal unit made by Digital Radio Systems of Clearwater, Florida. The PacketCluster bulletin board software is available from Pavillion Software of Hudson, Massachusetts. The key feature of this software is that it allows many different stations to be interconnected through the bulletin board at the same time. This means that one does not need to connect to and disconnect from each station to send a message. The message flow does not stop if a station is already connected to someone else. The message is typed into the bulletin board at the operator's speed, and when the message is ready the other station receives a one-line notice of the message. The basic commands, SEND and READ, are simple enough to be readily learned even by those not "computer literate." Direct connection from one station to another is usually simpler if only two stations are involved, but with multiple stations the bulletin board makes life a lot easier. The bulletin board is available for general use until an emergency is declared.

BCARES does not use the PacketCluster software features that allow transmitting DX spotting bulletins or connecting to other bulletin boards. Another bulletin board is available to send messages to other parts of the state or across the country but we have never had occasion to use it in a real emergency.

In December 1991, we tested a system of linked PacketClusters; this system is normally used for DX spotting in the Denver metro area. The system consists of three PacketClusters, each with their own 2m frequency, connected on 440 MHz. This test was very successful; even the skeptics were impressed. We had 50 stations connected at the same time, with 15 stations throughout the area involved in the exercise. Messages flowed transparently and rapidly from cluster to cluster; the system truly operated like one big bulletin board! We plan to use this system for major disasters involving packet traffic between counties.

Packet Problems and Pitfalls

Packet can be wonderful, but it can also be a big problem. We have spent innumerable hours discussing and experimenting with TNC parameters. After several years, we have settled on the parameters listed in Table 1. These assume a PacketCluster bulletin board, but seem to work well for general purposes. Perhaps the most important parameter is FRACK, which defines the time between retry transmissions. People get impatient and tend to set FRACK very low. However, if multiple stations on the same frequency do this, everybody ends up transmitting at the same time and nobody gets any traffic through. If you want a real disaster, have four or five stations typing on the same frequency, with FRACK set to about 2. The weaker stations will soon retry out and be disconnected.

Channel overload can be a real issue, even with correct parameter settings. In an overload situation, weak stations will be disconnected and it will take forever for a message to get through. There are two ways to deal with this problem. First, you can use more than one frequency. We recently upgraded our bulletin board to use two frequencies, and we estimate that we have almost doubled our traffic handling capability. A lower-tech solution is having the net control tell two packet stations to QSY to another packet frequency. To minimize interference, we do not operate on the national packet frequency of 145.01 MHz.

The second option is to limit or shut down lower-priority traffic. If you are handling disaster relief traffic, do not allow health-and-welfare inquiries to bog down the system. If you have an emergency message, order the other stations to stop typing.

A key to maintaining control is to require all packet stations to simultaneously monitor a voice frequency. This makes coordination and debugging problems much easier. We use a voice 2 meter repeater and a packet 2 meter frequency, with digipeaters if necessary. There is some interference, but it is usually not a big problem. A packet monitoring station, most often manned by a packet radio expert from his home, can also be useful in spotting prob-

lems and suggesting solutions.

Relationship of BCARES to Other Groups

The relationship of BCARES to the public safety organizations is virtually unique. Unlike a conventional ARES group, chartered by the ARRL, BCARES is chartered by the county communications center, which dispatches police, sheriff, fire, and other agencies. We are also sponsored by the Office of Emergency Preparedness (Civil Defense). By being government chartered, we are more accountable to the organizations that we serve. Boulder County's three ham radio clubs jointly support BCARES. The head of BCARES is recognized by the ARRL as the Emergency Coordinator for Boulder County, and BCARES is also legally the local RACES organization, but these titles are not important in our local emergency operations.

Photo B. Tim Groat KRØU transmits a packet message from the simulated fire line to the Boulder Public Safety building. Each packet field station consists of a laptop computer, printer, VHF radio, TNC and a gel-cell battery pack. Photo by David Fetter KA3HBK.

BCARES's first responsibility and primary focus is assisting the countywide communications center; any other requests for assistance are met only if resources are available. We primarily provide local communications via VHF packet and voice, although the public safety organizations know that we have other capabilities, such as HF, autopatch, etc. BCARES has never used traditional "long-haul" HF communications capability.

Traditionally, ham groups have been associated with the Red Cross or the local civil defense organization. Incoming health and welfare inquiries are a major part of what hams do in emergencies. These are worthwhile endeavors, but can limit the ham role. In some ways, the primary accomplishment of BCARES is that it has expanded the role of hams in emergency communications. To keep within our focus, BCARES does not plan to handle health and welfare traffic; we have determined that this is primarily the Red Cross's responsibility.

In Boulder County, the Red Cross has a separate group of hams that assist them with communications. BCARES and the Red Cross hams enjoy a cooperative working relationship. We share resources and hold joint exercises. We have discussed the possible merger of the two groups, but the agencies that we serve feel that they prefer two more focused organizations rather than one group that tries to be all things to all people.

How To Make Your Group Successful

BCARES has been successful by maintaining a focus on serving our "customer," the countywide communications center. A close relationship between the head of BCARES and an official of the countywide communications center has also been beneficial. The chairman of BCARES works closely with this official on both personal and professional levels. In effect, the people of the communications center depend on the head of BCARES to assure that the hams meet the communication center's needs.

How can you make your emergency service group successful? Sell yourself to someone who needs you. The first step is to sell your group to an agency in order to get them to "try the hams out" by including you in either one of their disaster exercises or in a real emergency. Choose an agency with which the hams have connections, or an agency that often has a need for supplementary communications.

The second step is to be successful in your trial. The key here is not to promise more than you can deliver. Be realistic. Plan ahead, practice, and then get the job done. Plan for equipment problems, and have backup equipment to ensure success. Focus on helping the agency, rather than getting written up in the local newspaper or getting your name in a ham magazine. Participate in the annual disaster exercises for the organization that you serve.

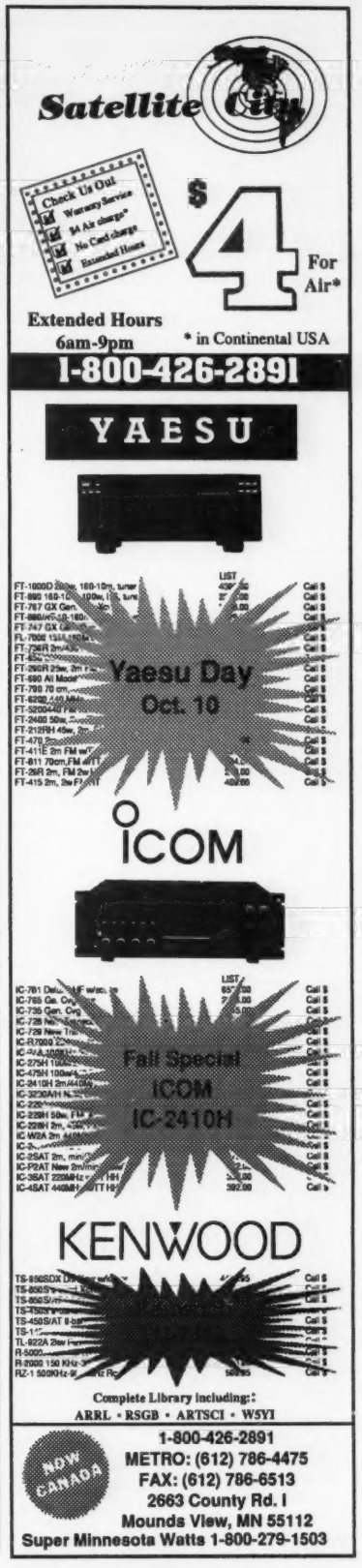
People are impressed by technology, and you will probably be more successful selling something that they don't already have. Most public safety organizations already have lots of HTs and people with clipboards. Do a demonstration of packet radio and hand them the hard copy. Perhaps a live TV picture would be useful—do a small demonstration, and persuade them to give you a try.

If you focus on serving one agency, and do what they need you to do, your group can be successful. Perhaps your group, like BCARES, will hear, "In a disaster, the dispatch center calls the hams before they order food."

TABLE 1. RECOMMENDED TNC PARAMETER SETTINGS

MAXFRAME 1
DWAIT 16 (low power stations use DWAIT 8)
FRACK 8
RETRY 10
CHECK 0
AX25L2V2 ON
SLOTTIME 10 (if supported)
PPERSIST ON (if supported)
PERSIST 63 (if supported)
(low power stations use PERSIST 128)

The above parameters are for a TAPR 2 or a modern TNC. For an older TAPR 1 TNC, use DWAIT 4, or DWAIT 2 for low power stations.



CIRCLE 153 ON READER SERVICE CARD

HOMING IN

Radio Direction Finding

Joe Moell, P.E., KØOV
P.O. Box 2508
Fullerton CA 92633

Toward the Optimum Mobile RDF System

In four years of writing "Homing In," I have discussed many different kinds of equipment for hidden transmitter hunts (sometimes called foxhunts or T-hunts). It should be clear by now that there is no single setup guaranteed to be ideal for every radio direction finding (RDF) situation.

Two meters is the most popular band for mobile foxhunting, and it's the VHF band that needs the most RDF work for self-policing. The beginning 2 meter hunter must choose among yagis, quads, Dopplers, phased arrays, and time-difference-of-arrival (TDOA) units. Each has advantages and disadvantages.

Most hunters hereabouts start out with a yagi or quad, rotated by hand on a mast extending out the vehicle window. They use their radio's S-meter to find the direction of the strongest signal, with an RF attenuator to keep the meter on scale when closing in. As they become more active, RDFers often drill a hole through the roof center or devise some sort of special rooftop antenna rotating system. Then they can turn a long beam without excessive (and illegal) overhang beyond the sides of the car.

Beam users say their method outperforms Dopplers and TDOA sets because the beam's high gain pulls in the signals of weak hidden stations. Furthermore, the beam can be oriented to hunt foxes that are either horizontally or vertically polarized.

In urban areas where multipath is present, the various direct and reflected signal components can be isolated as the antenna is rotated. That's a major advantage of the beam method over a Doppler or TDOA. But it's also a disadvantage, because interpreting the indications can be tricky and time-consuming.

Sometimes the S-meter reading constantly fluctuates as you roll along, due to signal flutter, multipath, and path blockage. That makes it a real chore to get an accurate bearing on the direct signal, while ruling out the reflected signal indications. Wouldn't it be great to be able to automate the process? After all, this is the '90s!

A Scope, Not a Meter

An installation that continuously rotates the beam and displays a polar plot of signal strength versus azimuth would be a real boon. Like a radar scope, the display should have some persistence so that the operator can easily "stack up" traces to tell the difference between momentary flutter and the more stable and repeatable direct signals.

The idea of radar-like display for VHF RDF isn't new. The late Jim Davis W6DTR built just such a system almost 30 years ago. His readout used a surplus cathode ray tube (CRT) with a long persistence P7 phosphor. Jim never got around to motorizing the antenna. He just turned it by hand to sweep the display around. Still, he became unbeatable in the Fullerton Radio Club transmitter hunts because his system was far more advanced than any other hunter's.

I received lots of inquiries after WB6UZZ and I wrote about the DTR scheme.* Many readers were convinced that this would be the perfect "secret weapon." Some have tried to emulate it and update it. One of the most successful so far is JaMi Smith KK6CU of Pasadena, California.

Photo A. KK6CU shows how his mobile CRT display is used. The storage scope is in a very deep cabinet, so it goes on the floor in front of the passenger/navigator.

JaMi loves to prowl the swap meets, looking for bargain radios, computers, and test equipment. He was able to locate inexpensive Tektronix Model 603 medical storage oscilloscope monitors for his RDF displays. (See Photo A. He has two of these setups, one at home and one in the car.) This saved him the task of building P7 CRT readouts, with their associated high voltage power supplies.

What's more, the storage scope is more "user-friendly" than a regular CRT because the operator can choose when to record traces and when to erase them with the press of a button. JaMi lets the traces build up for as long as he wants, then holds them in place while he measures them with the protractor he mounted to the face of the screen.

The storage scope requires 120-volt 60 hertz power. KK6CU uses an inexpensive square-wave DC-to-AC inverter made by Tripp Lite in his mobile installation. The inverter also provides AC power to the antenna rotating motor.

Automatic Polar Plots

When manufacturers want to know exactly how well their beam antennas perform, they take them to an antenna test range. Conditions there are ideal. Antennas are mounted on a tower high and clear of nearby objects. The test emitter is also in the clear, and the path to it is unobstructed. The results are those nice polar plots you see in the ads.

Under ideal path conditions with a single incoming signal, a CRT-type RDF gives a very similar display, as shown in Photo B. The large lobe indicates the direction of incoming signal. In this instance, it's 290 degrees relative to the vehicle. The higher the beam's gain, the sharper and narrower this lobe will be. The smaller lobes at 35 and 195 degrees could be signal reflections from nearby terrain features, but more likely they are minor lobes in the antenna pattern.

In a perfect situation like this, you

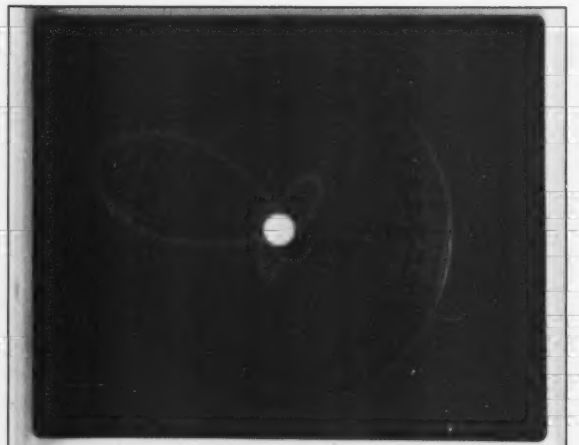


Photo B. The display of KK6CU's RDF system on a single continuous-carrier signal in the clear. It looks just like a polar plot of the 6-element quad.

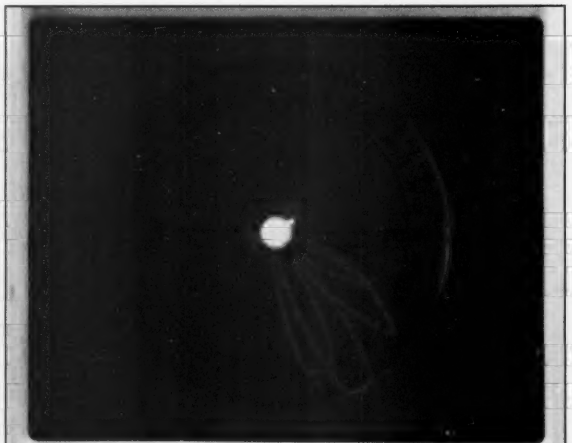


Photo C. Two sweeps of this CW signal give indications at 115, 130, 150, and 160 degrees. When you're in motion, it's hard to tell which is correct by reading the bouncing S-meter.

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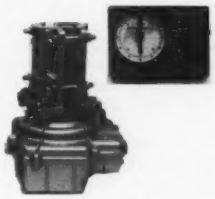

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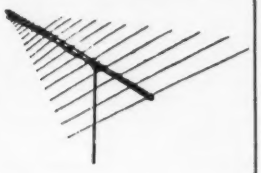

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could get a bearing just as easily by hand-rotating the beam and watching the receiver S-meter. But the high-tech display excels when the RDF environment gets unfriendly. It's much harder to interpret the S-meter reading when there is mobile flutter on the hider's signal. Worse yet, imagine the S-meter bounce when the signal switches on and off every second or so. (It's legal on some hunts!)

We gave JaMi's setup a workout by tracking a seismic beacon that sends keyed CW. Photo C shows two sweeps of the antenna. Because the signal is going on and off at the CW rate, each sweep gives two different apparent bearings. This illustrates the likelihood of error in an ordinary "spin it and read the S-meter" setup when the signal is keyed or fluctuating.

Since JaMi's beam rotates at 40 rpm, it takes only 30 seconds to build up a trace of 20 overlapping rotations on his storage scope (Photo D). Now it's easy to see that the correct bearing to the beacon is 145 degrees.

When the Going Gets Tough . . .

The CRT display is at its best in a "messy" RF environment. In Photo F, the large repeatable lobe easily identifies the direct bearing to the T, while reflections and noise in other directions show up as a jumble of non-correlated traces.

Suppose there are two hidden transmitters on the air. Then you'll get an image like Photo E, which was taken at the start point of a Saturday evening T-hunt. The hidden T for the evening is at 85 degrees. The lobe at 275 degrees is the fox for a daytime hunt that was still in progress on the same frequency. The single trace that goes off screen was caused by a momentary transmission from one of the hunters on the hilltop.

Note the fluctuation in the westerly signal. The hider isn't varying power. (That would be a no-no on this hunt.) The T may be near large moving objects. Perhaps it's right next to a freeway. Or there might be nearby aircraft causing reflections and flutter. Despite the fluctuations, it is easy to get correct bearings by "eyeball averaging" the storage scope display.

Doppler Beater?

Users of Doppler RDF units (see "Homing In" for February 1992) will say that their method is faster (hundreds of bearings each second) and it latches on to short transmissions with ease. PIN-diode-switched Doppler arrays have no moving parts and are much less conspicuous. Dopplers are easier to use because they have fewer controls to adjust.

Those claims are true, but the beam/CRT configuration tops Dopplers in other important respects. Its high gain antenna makes it much more sensitive, so you can hunt stations at much greater distances. With a twist of the quad's boom, KK6CU can track horizontally polarized foxes with the correct polarization, while Doppler users are stuck with vertical antennas.

The biggest advantage of the scope over a Doppler is its ability to analyze multipath and multi-signal situations. On the other hand, a Doppler set must give a single indication. It can't separate the two simultaneous equal-amplitude foxes of Photo E. Its indicator will probably not point to either one.

The polar plot gives a moving picture of the channel that clearly displays both hidden T's, and the operator can identify each one by ear from the receiver audio as the beam goes around. You'll appreciate this feature when you are jammer hunting because it becomes easy to separate the jammer's signal from that of the station being jammed.

One more advantage: Multiple sweeps of the CRT system will get bearings on single-sideband signals and pulsed noise sources. Dopplers, on the other hand, require carrier-type signals. They can't track SSB or noise.

Next month's column will show you how KK6CU designed and built his motorized mobile antenna. It really stands out! You'll also learn how the antenna's azimuth is sensed and how JaMi solved the problem of getting the RF signal from the 40 rpm whirling quad to the 2 meter receiver. 73

* See pages 249 to 255 of *Transmitter Hunting—Radio Direction Finding Simplified* by KØOV and WB6UZZ, published by Tab Books (#2701), available from Uncle Wayne's Bookstore.

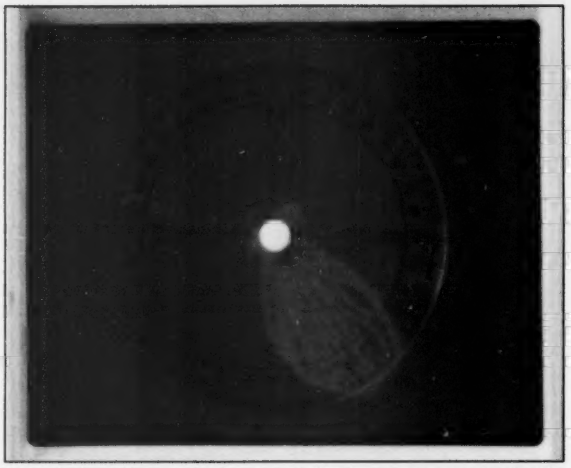


Photo D. Once 20 sweeps have built up on the storage scope, it's clear that the correct bearing is 145 degrees.

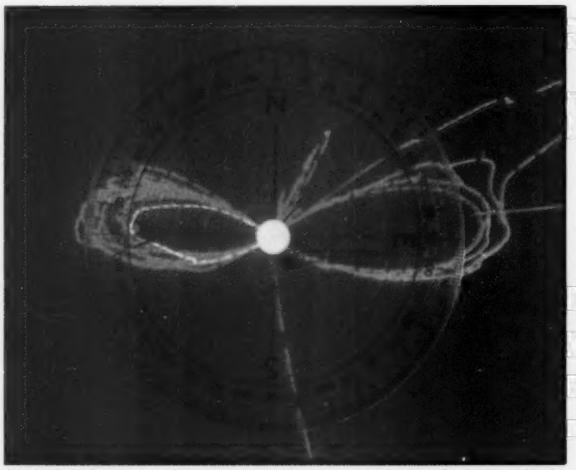


Photo E. A Doppler can't separate two simultaneous signals of equal amplitude, but KK6CU's CRT display and a good beam make it look easy.

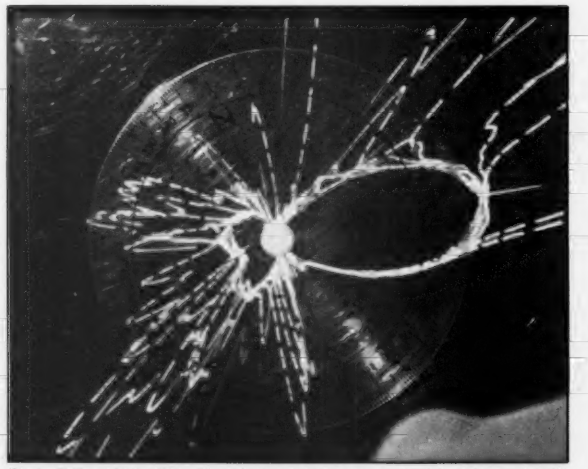
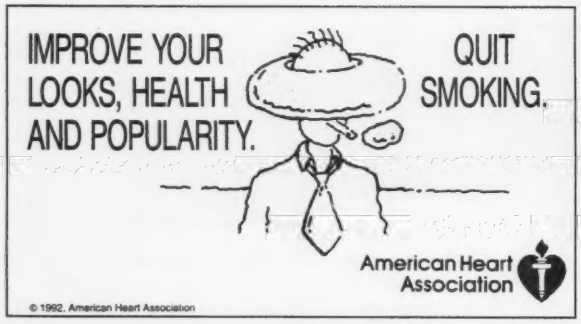


Photo F. The hidden T bearing stands out in sharp contrast to noise and multipath. Note that JaMi adjusted the compass rose to compensate for his vehicle's 25 degree heading on the hilltop. This makes the 105 degree lobe a true bearing (referenced to north) instead of relative to the vehicle.



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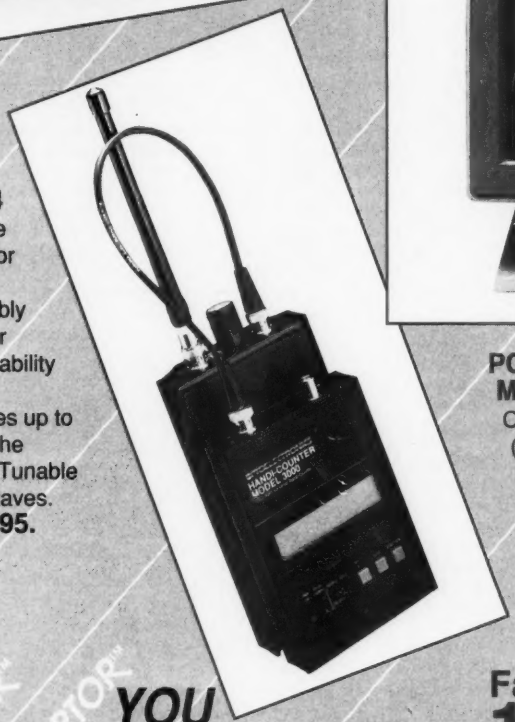

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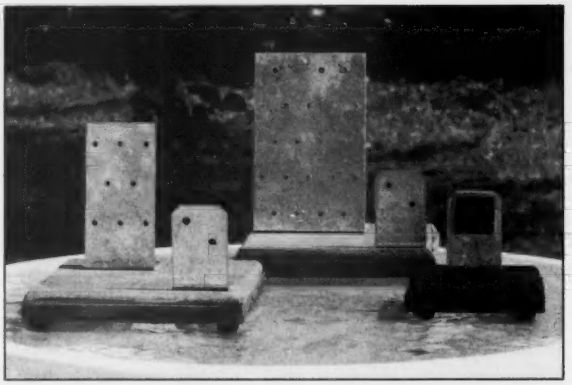
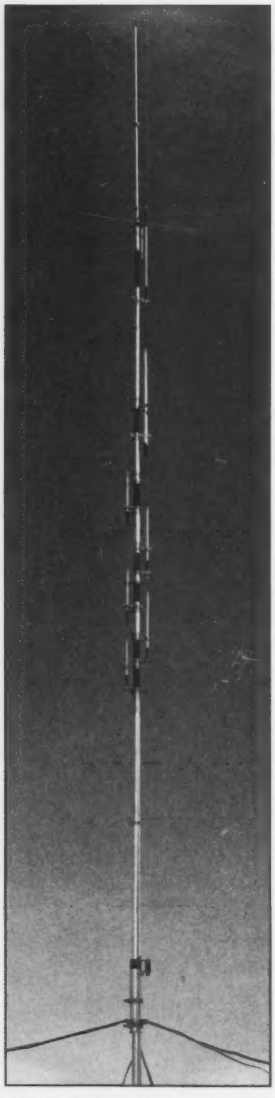
The stands are $14.95 plus $3.50 shipping and handling (check or money order). Other models are available for hand-held scanners, tall battery handhelds, and small SWR/power meters. Contact *Handie-Base & More, P.O. Box 2504, Broken Arrow OK 74013-2504; (918) 357-2139.*. Or circle Reader Service No. 201.





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Cushcraft Corporation has introduced the next generation of its eight-band quarter-wave antenna. The 26-foot AP8A covers 10, 12, 15, 17, 20, 30, 40 and 80 meters and weighs only 9.5 pounds. Constructed with double- and triple-wall tubing, the AP8A provides uncompromising strength for high wind survivability. Low-loss design and high-efficiency traps add up to maximum output. Today's active amateur will get superior eight-band operation with automatic bandswitching in one compact package. With quick assembly and a clean profile, the rugged AP8A will provide years of pleasure for amateurs and SWLs alike.

For the price and more information, contact *Cushcraft Corporation, P.O. Box 4680, 48 Perimeter Rd., Manchester NH 03108; (603) 627-7877, Fax: (603) 627-1764.* Or circle Reader Service No. 202.

CABLE X-PERTS

Cable X-Perts, Inc. has introduced an old favorite with a new twist: clear-jacketed RG Mini 8 (X). This new product has a very soft, extra-flexible, ultraviolet-resistant clear PVC jacket. Clear Mini 8X can blend into any surroundings, is aesthetically more appealing, and still has the same electrical characteristics as the standard 95% braid coverage black-jacketed material. The price is $.19 per foot for 100 feet and up. For more information, contact *Cable X-Perts, Inc., 113 McHenry Rd., Suite 240, Buffalo Grove IL 60089; (708) 506-1886.* Or circle Reader Service No. 203.

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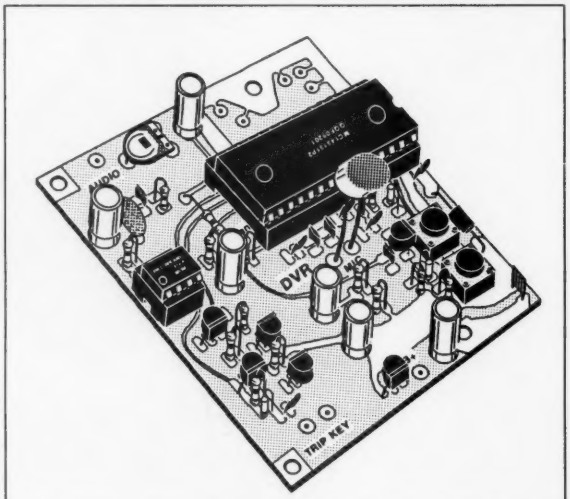
The DVR-1 Digital Voice Recorder is a versatile PC board module designed primarily as a voice ID'er for repeaters, but also providing features that let you use it as a contest CQ caller or a "radio notepad" to record short parts of received transmissions for instant recall. As a repeater IDer, the DVR-1 module will record your voice, using either the built-in microphone or an external mike. It can be used with almost any repeater COR module. The 20 seconds of recording time can be broken up any way you like. You can enhance the basic circuitry by adding a switch to select any of several messages, or set it up to announce periodically, even when the repeater is not in use. Using it as a contest annunciator, you can record a message or even several messages. Eliminate fatigue or strained voice working contests or DX! As a radio notepad, you can keep the DVR-1 module wired to the audio output of a receiver, ready to record up to 20 seconds of anything you might want to recall later.

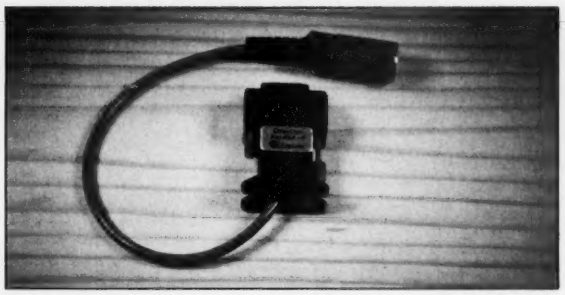
The DVR-1 module can be purchased either in kit form for $89 or as a wired and tested unit for $139. It includes a small electret microphone and push-buttons for record and playback. For more information and/or a complete catalog, contact *Hamtronics, Inc., 65-E Moul Rd., Hilton NY 14468-9535; (716) 392-9430, Fax: (716) 392-9420.* Or circle Reader Service No. 204.



MICROCRAFT CORPORATION

Microcraft Corporation has introduced the Personal Code Explorer, a new shortwave radio code processor for IBM compatible computers. Powerful software and hardwire combine in an exciting new product that reads Morse, RTTY, ASCII, SITOR/AMTOR, HF packet, and multi-level grayscale Fax signals to your computer screen. Personal Code Explorer untaps all of the power of your computer to provide more features per dollar than ever before. Exclusive highlights include a real-time on-screen oscilloscope to observe signals, digital noise filters, Microcraft Morse code algorithms, a user friendly interface, and more! Personal Code Explorer's hardware installs easily on your serial COM port and does not need a separate power supply. No need to open your computer case, either. Hookup to your radio speaker or headphone jack is easy. Personal Code Explorer supports CGA/EGA/VGA video and requires DOS 3.0 or above. It runs from a floppy or hard disk. A clear, comprehensive manual is included. Exploring code has never been so easy—or so much fun!

Personal Code Explorer is $129 plus $4 shipping and handling. For more information, contact *Microcraft Corporation, P.O. Box 513, Thiensville WI 53092; (414) 241-8144.* Or circle Reader Service No. 205.

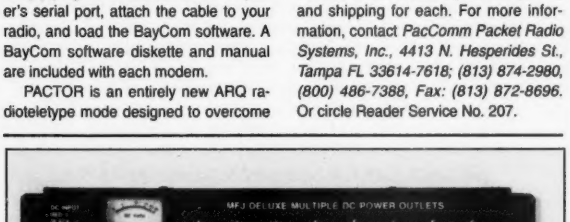


PacComm

PacComm Packet Radio Systems has introduced two new products: BayMod-9 and PacTOR. The subminiature BayMod serial port modems use BayCom TNC emulation software to access your radio through a serial port of the PC. The modem comes in two styles: BayMod-9 for 9-pin serial ports and BayMod-25 for 25-pin serial ports. PacComm's VHF serial port modems are the simplest and easiest way to get started on packet. The entire modem is contained in the serial cable housing. Simply plug the modem into the computer's serial port, attach the cable to your radio, and load the BayCom software. A BayCom software diskette and manual are included with each modem.

PACTOR is an entirely new ARQ radioteletype mode designed to overcome the shortcomings of both Packet and AMTOR for HF operation, providing a more rugged correction scheme and better throughput than AMTOR, making it a much more robust protocol than Packet under poor propagation conditions. PacTOR from PacComm is a hardware/software system which gives a four-fold throughput increase over AMTOR, while allowing the data flexibility packet users have become accustomed to. The PacTOR unit also supports AMTOR and RTTY operation, making it ideal for all modes of HF operation.

BayMod modems are $65 and the PacTOR unit is $290, plus tax (in FL) and shipping for each. For more information, contact *PacComm Packet Radio Systems, Inc., 4413 N. Hesperides St., Tampa FL 33614-7618; (813) 874-2980, (800) 486-7388, Fax: (813) 872-8696.* Or circle Reader Service No. 207.



MFJ

MFJ Enterprises, Inc. has announced the new MFJ-1116 Deluxe DC Power Outlet with voltmeter, switch and fuse. The MFJ-1116 is a neat and easy way to distribute 12 VDC to various transceivers and accessories. This multiple DC power outlet strip features eight terminals for connecting rigs and keyers, TNCs, tuners, etc. Output voltage is continuously monitored on its built-in voltmeter. The MFJ-1116 has a heavy-duty master power switch and a 15 amp fuse. Each of its eight outlets utilize heavy-duty five-way binding posts with standard spacing for dual banana jacks. Outlets are also RF bypassed. It can be installed on the rear of your desk and be used to eliminate "haywires."

The MFJ-1116 is priced at $44.95. For more information, contact *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762; (601) 323-5869, (800) 647-1800, Fax: (601) 323-6551.* Or circle Reader Service No. 206.

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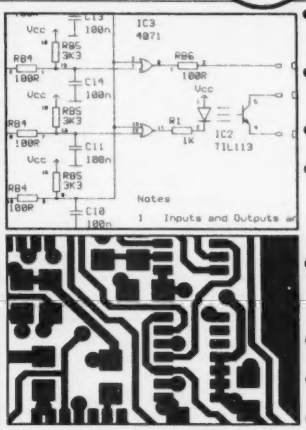

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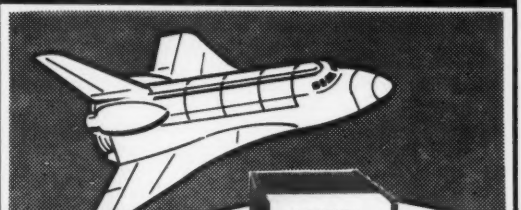

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OSCAR-21

AMSAT-OSCAR-21 was launched by the USSR on January 29,1991. It is also known as RS-14, RADIO-M1 and RUDAK-2. Groups in Molodechno, Moscow, Minsk and Munich were involved with its design and construction. The results of their efforts went to space as a part of the Soviet geological research satellite called *GEOS*.

Descriptions of the amateur radio components and complete frequency charts appeared in the May 1991 "Hamsats" column. The Soviet equipment included Mode B (70 cm uplink and 2 meter downlink) analog transponders and system-wide telemetry. The devices have worked very well after some initial difficulties with one of the onboard receivers.

The German portion of the package has yet to be fully exercised, but some of the experiments have provided surprising results. Not only has the satellite been heard speaking plain English text, but it has also been configured to act like a crossband FM repeater. Current undertakings include high-speed data transmission and a form of voice mail.

Known as RUDAK-2, for Regenerative Umsetzer fur Digitale Amateurfunk Kommunikation, or Regenerative Transponder for Digital Amateur Radio Communications, Version 2, the German apparatus has several possible configurations beyond those of earlier ventures. RUDAK-1 went to space with AMSAT-OSCAR-13. Due to a mixture of problems, it has not worked. It was to be a purely digital communications transponder and was quite simple compared to RUDAK-2.

FM Repeater in the Sky

In addition to the digital functions of RUDAK-2 shown in Table 1, the system can appear to operate in an analog fashion through the use of DSP (digital signal processing). Using the high-speed RTX-2000 RISC (Reduced Instruction Set Computer) processor in RUDAK-2 to produce speech from uploaded files or analog input from one of the uplink frequencies, the unit can send voice via an FM modulator. The uplink frequency is 435.016 MHz to a downlink of 145.983 MHz. It can appear to act just like a standard FM repeater, but it's all in the software.

Many stations discovered that it was a lot of fun to participate in 10-to-20-minute group conversations with participants thousands of miles apart using FM for both the uplink and downlink. During early tests, five minutes of each 10-minute period were set aside for the FM repeater mode. The other five were used for telemetry at 400 bps PSK. Later schedules only included one minute of telemetry for every nine of FM operation.

Doppler shift caused by the fast passage overhead was not a serious problem, due to the use of FM. The RUDAK receiver appears to be quite wide. Sensitivity of the system is not as good as the equipment on the Russian space station *Mir*, but most earth stations with 50 to 100 watts ERP (Effective Radiated Power) have been heard. Efforts to make contacts with less ERP on the uplink frequency are possible but very difficult.

Satellite Contacts on an HT

Using only a handie talkie, many stations have made contacts with one of the space shuttle missions carrying SAREX. HTs have worked with *Mir* on even more occasions. The amateur radio satellites typically use modes like CW and SSB and different bands for uplink and downlink. Some HTs, like the Santec LS-202A, can receive SSB, and many can transmit clean CW by keying the microphone line, but there are currently no multimode, dual-band handhelds.

When FM was activated for both uplink and downlink on A-O-21, many stations got on the air with anything available that could hear FM on 2 meters and provide FM output on 70 cm. The 145.983 MHz downlink is quite clear when heard on 145.985 MHz by a receiver with 5 kHz tuning increments. For the 435.016 MHz uplink, transmitters set to 435.015 MHz did well when used with directional antennas or power levels over 50 watts. Dual-band HTs using normal "duck" antennas and power levels below 5 watts can usually hear the 2 meter downlink very well, but have little chance of getting into the transponder without some help.

While in Austin, Texas, for a recent hamfest, AMSAT Vice President of Operations Keith Pugh W5IU was explaining satellite tracking to observers at the AMSAT booth. He was using A-O-21 as his sample satellite since many could copy the signals on their HTs simply by stepping out to the parking lot and listening. The example pass this time went directly overhead. It was a good candidate for experimentation.

On previous occasions I had made contacts through A-O-21 using relatively simple systems, but all had been with home antennas, portable beams or with amplifiers and large mobile whips. Those aids were not available on this trip to Austin, but the pass was a really fantastic opportunity to try for a contact. The high elevation (overhead) meant the distance to the hamsat would be less than a thousand miles at closest approach.

It worked. About halfway through the pass, KB8KVY in Cleveland, Ohio, was checking for weak signals and other hams who might want to join in the round-table discussion passing by in space. After several attempts using an Alinco DJ-580T, I could hear my own voice through the earphones. I had them on to avoid feedback and was also using an external microphone to allow quick repositioning of the HT for best received and transmitted signal while talking. An unsuspecting VW bug was used as a reflector to enhance the signal levels. Several transmissions from my HT satellite station could be heard quite clearly, with some white noise, through RUDAK-2. QSO information was exchanged with KB8KVY and congratulations were passed around at the Austin end of the contact.

Photo A. Andy WA5ZIB completing a contact via AMSAT-OSCAR-21 using a dual-band Alinco HT. (Photo by N5EM.)

There were several keys to the success of the contact. The satellite was at its closest point to my location. The antenna was a long dual-band type. I was using the Diamond RH77B (15 inches long). Power output was 5 watts on 70 cm. Received signal levels measured several S-units on the 2 meter side. A car was used as a reflector to enhance both uplink and downlink. Earphones and an external mike were incorporated. A little luck and a patient KB8KVY helped dramatically.

HT Modifications

Most dual-band HTs sold in the U.S. do not transmit below 440 MHz without modification. The Alinco is no exception. The manual that comes with the radio describes a modification to allow reception of aircraft AM signals down to 108 MHz. This requires cutting a red wire located just inside the metal baseplate at the bottom of the radio. The modification does not mention the blue jumper in the same area. To allow the radio to transmit outside the 440-450 MHz range, this blue wire must be removed or cut in a fashion identical to the instructions referring to the red wire. Both wires are easily identified since they form large loops just asking for the application of wire cutters.

After the target wire or wires have been detached, the unit must be reassembled and reset. To achieve this and enable the desired features, the "function" button must be pressed while turning the transceiver on. The LCD display will momentarily display all available digits and modes, and when the function button is released they revert to a normal display with 145.00 on the VHF side and 445.00 on UHF. The radio is now ready for A-O-21 operation.

Most stations that have used the DJ-580T for satellite work employ their home-station beam antennas or amplifiers for the 70 cm uplink. Although it is possible to make contacts on the system described above using only a long "duck," it is not easy and it will not yield many contacts. However, it proved a point: It can be done.

In a few years cellular phone operation will be available via low-earth-orbit satellites like Motorola's proposed Iridium constellation. Their system is designed to use 77 satellites. The "cells" (satellites) will orbit the earth keeping at least one over every location in the world. Until then amateurs can lead the way with inexpensive radios and innovative hamsats like A-O-21.

The AMSAT Annual Meeting and Space Symposium

AMSAT North America is getting ready for its Annual Meeting and Space Symposium. This year's event will be held at the international headquarters of Intelsat in Washington, D.C., over the weekend of October 9th through 11th.

Activities will begin Friday afternoon with registration, tutorials and a special AMSAT/ARRL education workshop. A full schedule of presentations ranging from talks for beginners to highly technical items dealing with the Phase 3D project will continue through Saturday.

The Saturday evening banquet will be followed by award presentations and a question-and-answer session

Continued on page 54

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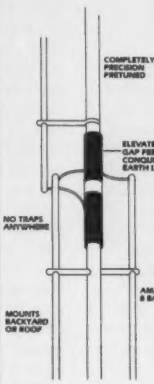

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Gain & Wave:
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446MHz 6.0dB
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Gain & Wave:
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5/8 wave
446MHz 7.2dB
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5/8 wave
446MHz 6.0dB
5/8 wave x 2
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UHF (PL-259) OR
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CA-2x4MB
Gain & Wave:
146MHz 4.5dB
7/8 wave
446MHz 7.0dB
5/8 wave x 3
Max Power:
150 watts FM
Length: 4' 10"
Connector:
UHF (PL-259)

CA-2x4SR
Gain & Wave:
146MHz 3.8dB
5/8 wave
446MHz 6.2dB
5/8 wave x 2
Max Power:
150 watts FM
Length: 3' 4"
Connector:
UHF (PL-259)

B-20
Gain & Wave:
146MHz 2.15dB
1/2 wave
446MHz 5dB
5/8 wave x 2
Max Power: 50 watts
Length: 30"
Connector:
UHF (PL-259), OR
NMO (B-20 NMO)

B-10
Gain & Wave:
146MHz 0dB
1/4 wave
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RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
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Entry Level Question

Digital modes may be all on and off, but the levels of understanding are clearly all in variegated shades of gray. I received an inquiry via CompuServe from Kevin Cornwell N6ABW dealing with packet. He relates being at a friend's house and seeing packet demonstrated for the first time. He'd like to tinker and get onto the mode. He has an Atari XL/XE computer, and the know-how to use the stuff, but no idea what the packet protocols are. Kevin wonders if he needs to write his own software, and make up interfaces, so he feels he needs to know it all.

Well, Kevin, you may be trying to reinvent the wheel. The packet protocol is composed of discrete "packets" of data, each packet containing a header with addressing information, data itself, and error-checking information in a precise scheme.

Putting the software together to handle the data exchange and handshaking is no mean feat, and many programmers have worked long hours to produce tight code that satisfies today's demanding amateur. Take my advice, don't even try, at least not now.

Use the Atari as a terminal, running just about any communications protocol you have for telephone communications to talk to a dedicated packet or multimode controller. For all intents and purposes, the AEA, Kantronics or MFJ units are all comparable; choose by personal preference, features, and bells and whistles. Later, after you've been on the air for awhile, you might try your hand at writing some dedicated software. Who knows, you might even turn up someone else who has already started such a project. But for now, if you want my advice, keep it simple!

As to the details of the packet protocol, we have covered this topic at length in past issues of "RTTY Loop." If you would like to see this information again, or for the first time for newcomers, or would like more on this topic, please drop me a line via any of the channels described below, and I will be happy to comply.

Hamsats *Continued from page 52*

with the new AMSAT Board of Directors. Other activities are being planned for Sunday.

Registration forms are available from AMSAT headquarters. Call (301) 589-6062 or write to AMSAT, 850 Sligo Ave., Suite 600, Silver Spring MD 20910. Talk-in frequencies in Washington include 146.955/355 MHz and 224.94/223.34 MHz. This is a fine opportunity to spend time with the family in the nation's capital investigating our past while looking into the future of the amateur satellite program. 73

Regenerative Transponder RUDAK-2

Uplink	RX-1	RX-2	RX-3a	RX-3b	RX-4	Unit
Frequency	435.016	435.155	435.193	435.193	435.041	MHz
Speed	1200	2400	4800	9600	DSP	bps
Modulation	FSK	BPSK	RSM	RSM	any	
Coding	NRZIC	Bi-0-S	NRZIC	NRZI	I+Q	
	BI-0-M		BI-0-M	NRZ-S+scrambler		

Downlink: 145.983 MHz with 3 watts typical (10W optional)

Mode 1:	1200 bps, BPSK, NRZI (NRZ-S) (like FO-20)
Mode 2:	400 bps, BPSK, Bi-0-S (like OSCAR-13 beacon)
Mode 3:	2400 bps, BPSK, Bi-0-S (planned for OSCAR-13)
Mode 4:	4800 bps, RSM, NRZIC (Bi-0-M)
Mode 5:	9600 bps, RSM, NRZI (NRZ-S) + Scrambler
Mode 6:	CW keying (only for special events)
Mode 7:	FSK (F1 or F2B), i.e. RTTY, SSTV, FAX, etc.
Mode 8:	FM modulated by D/A signals from DSP (speech)

Table 1. Configuration of RUDAK-2 on A-O-21.

Photo B. The Alinco DJ-580T set up for full duplex, FM crossband operation via A-O-21.

The MFJ-1271 TNC.

New Commodore TNC

For Commodore 64/128 users, MFJ has come out with an inexpensive packet solution, the MFJ-1271 TNC. This low-cost, one-board unit plugs into the Commodore's rear cassette port. Working both VHF packet at 1200 baud and HF packet at 300 baud, all you will need to get on the air is the computer, a transceiver, and the MFJ-1271.

A high performance modem/TNC with integral DCD circuitry and an adjustable threshold control allows the unit to reduce the noise susceptibility which so often troubles communication on the HF bands. Remote packet operation, message forwarding and Net/ROM emulation are also features of this inexpensive unit. The driving software is the Digicom/64 program, available from many sources, or from MFJ separately as their MFJ-1293.

Oh, the price! This little wonder is available from MFJ for "only" $49.95. They want $5 more for the software, and that's got to be a good deal, too. Contact any MFJ dealer, or MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762, toll-free order line 1-800-647-1800. Do I have to remind you to tell them you read about it here, in *73 Magazine*'s "RTTY Loop"? I thought not.

Old Commodore TNC

I received a letter from Archie MacLellan VE1CEL of Antigonish, Nova Scotia, with a different twist on a problem. Archie relates that he now uses a PK-232 with a Commodore 64, and is planning to trade up soon to a PC compatible. Over the last few years he has acquired other terminal units, including the AEA CP-1 and HAL CRI-100. He used these units with either Kantronics Hamtext or AEA MBA-TOR with the Commodore C-64.

Now that he is moving up to a PC compatible, it seems there is no software to use with these terminal units. The CP-1 and the CRI-100 are from the era before the PC was the norm in computers, and it seems that no one has written a commercial program to use them with the PC family of computers.

Archie is looking for some software to use these units with PCs. Has anyone out there in RTTY land worked such a transformation? It would seem straightforward enough, presuming interfacing and protocols can be worked out. Let me know, and I'll pass the information on to both Archie and the interested readers of "RTTY Loop"!

Software Available

Speaking of low-cost software, the "RTTY Loop" software disk remains available. Containing a collection of public domain and shareware ham programs for the IBM PC compatible family of computers, this disk is updated whenever I find something new to put on it. All you need to do to receive the information is send me a blank disk, either 5.25" or 3.5", a self-addressed *stamped* disk mailer, and $2 in US funds, all mailed to the address at the top of this column, and I'll turn the disk around and mail it back to you. Now, there is enough material to just about fill a 1.44 Mb high density floppy. So, if you send me a 360 kb floppy, you will get less "stuff" than sending me a high density floppy. I don't mind it if you send two low density disks; I'll fill both of them with different programs. But I've got more than a meg of software to send, so the more media space you provide, the more material you get.

Speak to Me

I have enjoyed the torrent of your comments received through CompuServe, America Online, and Delphi. Many of your requests and observations will be finding their way into future columns. Please keep them coming; I enjoy and read every one, and try to answer the messages as soon as I can. Address e-mail to me on CompuServe via ppn 75036,2501, on America Online to MarcWA3AJR, and on Delphi to MarcWA3AJR. Those desiring to use conventional paper mail can, of course, address correspondence to the address at the top of this column.

I have posed several questions over the last few months about possible topics to be included in future "RTTY Loop" columns. I mean it, I really do want to hear what you have to say. Drop me a card, letter, or e-mail, and express your opinion. At least here, your vote really *will* count! 73

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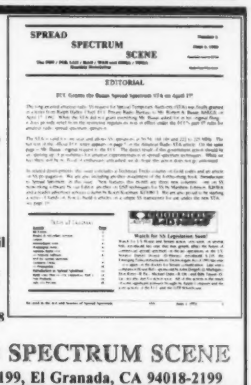
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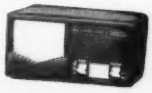

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10 GHz WBFM Transceivers Q & A

I have received numerous questions concerning the 10 GHz Solfan Gunn oscillators and other similar types of units. The questions all focus on different oscillator cavities and the adjustments required to put them in operation in the amateur portion of the band near 10.250 GHz. These commercial units as stock operate on 10.525 GHz and must be lowered in frequency to make them usable in amateur service. This information was published several years ago, but it needs repeating again due to continued interest and new units appearing on the surplus market.

The first question comes from Dick KM6PA, "Do you have reprints of the `10 GHz Fun' article, April 1990? I recently purchased two Solfan intrusion devices." Dick states that he was fortunate enough to get the entire unit, and when it is powered up the red LED indicator on the unit comes on. Passing his hand in front of the waveguide horn antenna causes the LED to come on and then go off again after a short interval. What is the application?

Well first, yes Dick, I have reprints of "10 GHz Fun" and include them with the system PC board kit/30 MHz IF amplifier for Gunn transceivers that I make available. Also, check with *73* for articles in back issues on this, and other articles you may have missed. Cost is only $3.95 per back issue, if available. Article reprints are $3.00.

Secondly, concerning your question on the alarm units and its LED operation, the Solfan-type alarm units were originally intended for motion detectors for the alarm industry. Motion was detected and transformed into an audio tone to activate the alarm unit circuitry: LED dark, no alarm; LED on, alarm/motion detection.

The return audio tone that is received is interpreted by the alarm unit as something in its path of radiation and activates a relay in the unit for an alarm condition. Part of the reason these units were junked is false alarms which can be caused by "large bugs, moths, etc." flying into the microwave beam, or people walking outside a building near an interior microwave unit. The units could "see" through some walls. False alarms in the alarm industry have led to more reliable units, hence the dumping on the surplus market of these microwave burglar alarms and motion sensors. They are being replaced by infrared systems, or combination systems.

Another interesting relationship exists between microwave units and radar speed detectors (they are quite similar). If you take a transmitter and point it towards some distant traffic (automobiles) and connect your phono amplifier to the detector, you will be able to listen in to the "radar" function. What happens is that the receive tone is shifted in frequency due to the motion of the target, and is representative of the object's speed. The return transmitter frequency is shifted approximately 130 hertz for each mile per hour of the object speed. For example, at 10 MPH, the return tone would be about 1,300 hertz, or cycles if you prefer. Coupling the transmitter receiver to your phone amp is one application to demonstrate a simple "radar" application of microwave. See Figure 1 for the Doppler radar setup.

Ed Reidell, N. Versailles, Pennsylvania, questions an old *73 Magazine*, October 1986, article titled "Microwave Building Blocks for the IF Amplifier." The article covered a TDA-7000 single-chip receiver that could be used in conjunction with a WBFM microwave transceiver. Ed questions the use of this same IF system in construction of an FM receiver for higher frequencies like 2 meters and above. Could it be equipped with suitable converters using the TDA-7000 chip receiver, as in an IF amplifier?

Yes, Ed, the chip will work in this application. The TDA-7000 chip can work to about 120 MHz without converters. It was originally intended to be a commercial band FM receiver, 88 to 108 MHz. To extend operation to a higher frequency I suggest the NE-604 and NE-602 converters from National Semiconductor. Their use in front of the TDA-7000 would extend operation into the UHF region. Other alternatives would be the transistor converters found in almost any issue of the *ARRL Handbook*, VHF/UHF chapters.

Ed's and Dick's questions are typical questions I receive concerning microwave and the IF system using the TDA-7000 30 MHz IF amp, and Solfan-type systems in general. Let me expand on some of these questions and other points of interest covering the whole system package that can make operation on 10 GHz quite inexpensive.

Solfan Units

The typical Solfan-type units should not be expensive. The surplus units typically cost about $25. A new Gunn diode transceiver (similar to the Solfan) is available from EMCOMM Industries, and the cost is just under $50 (that's brand-new).

These cavities differ in construction from the Solfan-type by being quite a bit smaller. See Figure 2 for cavity details. The cavity incorporates a detector diode positioned off-center in the waveguide (WG-16). The Gunn diode is on center, located just behind the detector. In front of the detector is a small piece of ferrite that appears to act as a circulator. This device will have to be tested, but it looks quite good. Ed Emich N2NPR of EMCOMM Industries will stock these units provided there is sufficient interest in them; cost per unit is $50. Contact Ed Emich at EMCOMM Industries, 10 Howard St., Buffalo NY 14206; phone: (716) 852-3711. Cavities such as these are quite simple but popular, due to their low cost, in WBFM applications for 10 GHz operation.

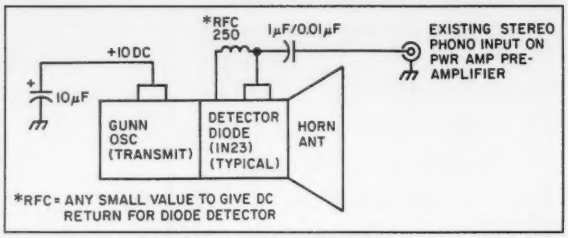

Figure 1. Simple Gunn Doppler "radar" motion detector. Audio tone equals approximately 130 Hz per MPH.

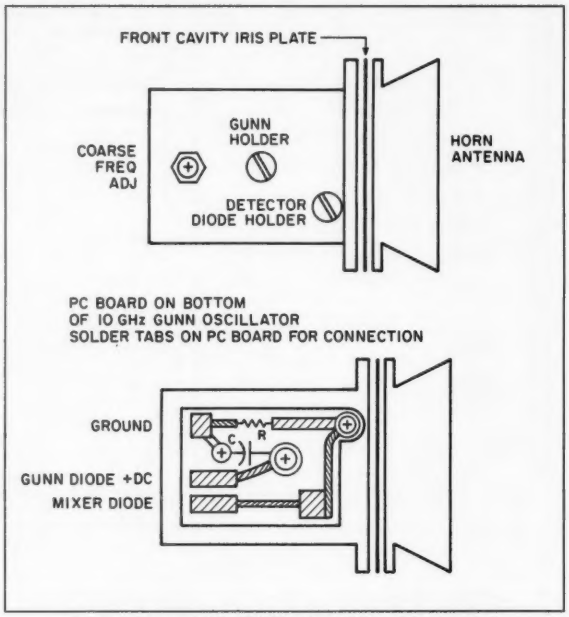

Figure 2. Drawing of the EMCOMM Industries cavity (see text).

The top-of-the-line unit that is available for WBFM on 10 GHz is the Gunnplexer™. This unit is manufactured by Microwave Associates and costs about $150 each for their varactor-controlled Gunn oscillator/detector assembly. This cavity design incorporates varactor frequency control, which operates quite well, giving some 90 MHz frequency variation. Voltage is varied on the varactor for frequency tuning and keeping the Gunn voltage fixed, making for high stability.

By comparison, the Solfan-type units are simple and inexpensive; conversion to amateur frequencies is just an adjustment away. Coarse frequency on all units is set similarly by a mechanical adjustment screw. On the Solfan unit, this is the only mechanical adjustment possible. Further Solfan frequency adjustment is made by varying the Gunn diode voltage between 7.5 and 10 volts for a corresponding frequency change of about 5 MHz. (Fine frequency is set at 9.5 volts, with the coarse adjustment mechanical screw used to set the frequency desired.)

The Solfan detector is connected to an IF amplifier for receive and the Gunn diode (transmitter) is modulated by a simple voltage regulator type modulator. That's all that's needed to construct a 10 GHz WBFM transceiver. The IF system can be any IF strip that is convenient, such as an old FM radio converted to a lower frequency or used as is. I prefer to use 30 MHz in the system I developed, using the application notes from Signetics on their single chip FM receiver. The result was the receiver system described in "FM Fun" and the earlier "Microwave Building Blocks" article.

In those articles, the system IF board was developed to support either the Microwave Associates Gunnplexer™ or a simpler surplus motion detector like the Solfan. The PC board IF amplifier has 5 microvolts sensitivity at 30 MHz, and when used with a preamplifier, puts the total IF sensitivity near 0.2 microvolts. The system board also contains the power supply modulator circuitry for the Gunn diode. This type of modulation can be changed when using the Gunnplexer units by switching the modulation to the varactor instead of the Gunn diode, as used in Solfan-type systems.

For those considering using these alarm-type microwave units in amateur

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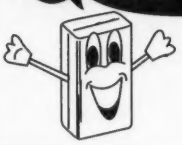

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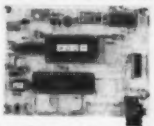

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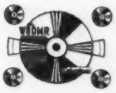

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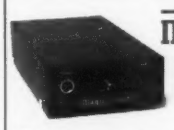

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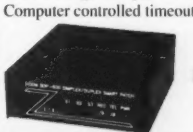

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applications, they can be made to work well with little effort. The main item used from the motion detector is the metal microwave cavity. Everything else can be discarded. Couple with the basic microwave head, which can be obtained as surplus, or use a new unit offered from EMCOMM. All you need to finish a system is to add a simple 30 MHz IF system. This unit incorporates not only the receiver but the power supply modulator to complete the 10 GHz transceiver system for WBFM. For amateur use, scrounging is paramount, and getting a simple rig operating on microwave for little cost can be very attractive.

Getting back to the Solfan cavity, some of the questions that have come in from time to time are mainly concerned with the pinouts and screw adjustments that are part of the basic cavity. Larry K1LPS made a drawing covering this very subject, I have included it as Figure 3. There are single cavities with only a Gunn diode. The dual cavity is identical with the single cavity in all respects; it just omits the detector diode portion of the cavity.

Single cavity systems can work as transceivers but are not as sensitive as the dual unit with the detector diode. In the single unit a self-detect type of operation is going on using the Gunn diode for both transmit and receive. It works but lacks sensitivity. Units that have a separate detector diode are more sensitive. The RF output of either unit is normally coupled into a small horn antenna.

Another question that arises concerns defective Gunn devices. To this end I have supplied some replacements that are suitable for the Solfan cavity. These are not suitable for use in the Microwave Associates cavity due to the case style of their device. The diodes that I obtained have a 3/48 thread mount on the heat sink side of the diode and are about 0.2 inches long. The usual method to mount them is to drill a hole in the end of a brass 10/32 bolt and tap for 3/48 to thread the Gunn device into. If your cavity will take this type arrangement then it will work. See Figure 4 for case styles.

The main purpose of these notes is to provide guidelines on how to use the Solfan motion detector or other similar units as a Gunn transceiver for 10 GHz. The basic Solfan unit has a horn antenna that has a gain of 10 to 11 dB gain and a beam width of 50 to 60 degrees. Removal of the metal cavity with the associated components attached to it from the alarm unit is all that is needed. See Figure 3 for Solfan cavity details (it provides you with all the information on what each adjustment screw is for).

The frequency of these units as they come from the factory is set to 10.525 GHz. Frequency setting to the proper or usual amateur frequency is the toughest part of conversion due to a lack of frequency setting equipment in most ham shacks. This equipment is quite expensive and can be damaged by high levels if not used properly. That's why most hams who have them don't loan them. Possible ways to set frequency are to compare it to another working unit or to get a microwave wavemeter from surplus for frequency setting applications. If you have one and are unsure of its calibration, I will "for the cost of postage" re-calibrate surplus wave meters sent to me. The normal frequencies we usually calibrate include 10.230, 10.250, and 10.280 GHz, the standard WBFM 10 GHz frequencies.

Note that the spacing of frequency is exactly 30 MHz, the system IF frequency. These units operate full duplex and both ends of a communication path have their respective transceivers set to a frequency 30 MHz apart from each other to communicate. The transceivers use their transmit frequency as the local oscillator for receive injection. This produces the IF frequency difference of 30 MHz in this case. A 30 MHz difference for an IF is not sacred, as any standard agreed-upon frequency can be used. The trick here is that both stations must be offset by the same frequency to communicate full duplex. Well, that's it for WBFM Gunn units for this month. Hope this note helps expand information on your system.

Mailbox

Bill Notine K6HH writes that he enjoys the column and uses it to keep up with progress in microwaves and the other amateur applications presented here. He worked in microwave development during WWII and later for Raytheon Electronics before opening his own business. Bill states that he has a lot of interest in microwave technology and tries to keep up with new developments. Bill's been working on digital modulation and has published part of his work in the June and July 1988 issues of *73*. One question that Bill asked me which I was unable to answer concerns "BASS," or Bulk Avalanche Semiconductor Switch. Well, Bill, that's a new one on me, I can only speculate on what the application is. I suppose by the name and nature of GaAs (Gallium Arsenide) or some other semiconductor in an avalanche state means that we have a very low loss high current switch which is much better than any transistor or FET currently available.

I might be way off base, but would conclude that it might be a device that would replace high power VMOS FET switches. These devices can switch very high currents and high voltages in speeds in the nanosecond range. One V-MOS device that I am familiar with is the IRFP-140, which can switch 100 volts at some 140 watts dissipation. The trick with these types of devices is that the drain-to-source resistance of the device in the "ON" state is in the order of an ohm or less! That means lots of current and little device junction heat to dissipate, hence high efficiency. In the "OFF" state the drain source resistance is in the megohms, really off. Does anyone know for sure what a BASS is, besides a fish? Am I on track or way off base? Let me know. Bill's Hotine address is 633 Ramona Ave. #23, Los Osos CA 93402.

Joe Johnson WB8RDY, 2312 Cunninghan Dr., Opelika, Alabama 36801, needs information on several TWTs he recently picked up. Joe is in need of information and schematic diagrams for the devices. What Joe picked up were Alfred Electronics Model 5302, and a TWT tube from GE-type GL-7393. The second unit was mounted in an Alfred Model 503. Sorry Joe, I tapped out in my information stock pile. Most of the Alfred information that I have lists TWT amplifiers and sweep plug-in units with model numbers in the 560 range and sweep plugs in the 650 range. Anyone have anything in their shack to help Joe out?

Ellis W4ILY, who has obviously kept back issues of *73 Magazine*, asks, "Is the PC board and parts still available for

Continued on page 60

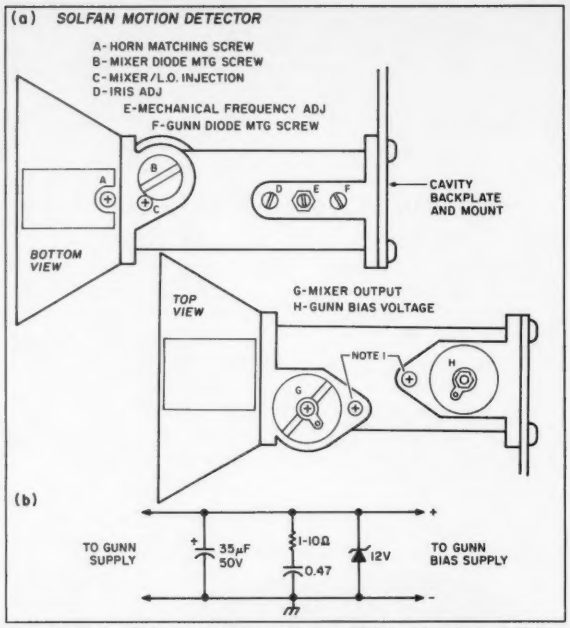

Figure 3. Typical Solfan cavity design adjustment/DC feed locations. a) Note 1: There is a cluster of parts attached to these two screws, one of which is a ground lug and the other insulated. See text. Note 2: All adjustment and mounting screws use a liquid lockwasher compound. Use moderate heat and/or suitable solvents to clean these. Use caution when removing so as not to break off these screws. b) Recommended Gunn protect network (see text).

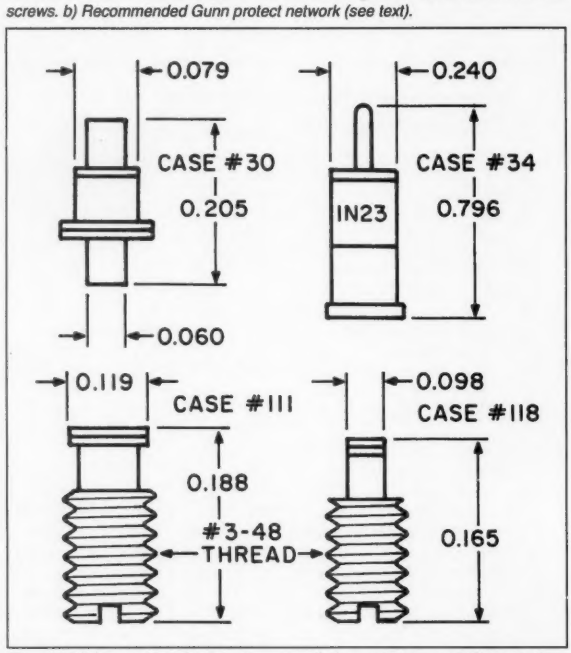

Figure 4. Various case styles for microwave diodes, detectors, and Gunn devices. All dimensions are in fractional inches.

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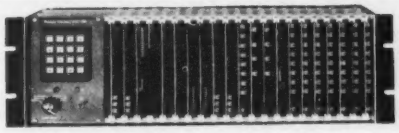

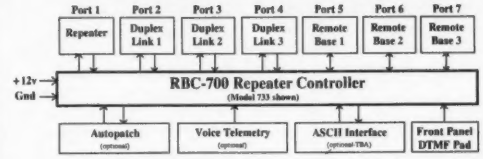

The RBC-700 Repeater Controller is designed to support Repeater systems that require multiple radios connected together at a site. The RBC-700 utilizes a true 7 x 7 audio matrix switch which allows several conversations between ports at the same time. In the illustration above the 733 model is supporting a Repeater, 3 Duplexed Links to different sites, and 3 Remote Bases. Using simple commands, a user could tie the Repeater and a Remote Base to one Link, while the other Links are communicating through your site, holding separate conversations. Or, connect all of the ports together - like a big party line !!

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AC Line Voltage Monitor

My shack is in an old house in a very old neighborhood. Instead of the AC service being 220-VAC split phase, only 110 VAC is brought into the house from the pole transformer. While mine is a "worst case" example, your line voltage will vary from its nominal 117 VAC, sometimes a lot. This is especially true during "brownouts" when everyone is either cooking with electric ranges, or using electric heat or air conditioners. It is also true when you are using a lot of power in your home, including that you use in your shack. It is advantageous to be able to monitor the line voltage, but most commercial voltage monitors, even those occasionally illustrated in ham magazines, represent an outlay of many precious dollars. Most hams are unwilling or unable to spend such a sum merely to keep track of their line voltage.

The simple AC line voltage monitor described in this article can be put together from just about any junk box, without spending a cent. Even if all new parts are purchased, the total cost should not exceed $3.

The circuit of this voltage monitor is shown in Figure 1. Two diodes, a capacitor, a small potentiometer and a DC meter of any size up to 10 mA full-scale are the only parts you need. As shown, my monitor measures from 90 VAC to 130 VAC over the entire scale of the old 500 mA meter I pulled from my junk box. You can easily change the range of voltage displayed merely by changing the value of, or eliminating, the capacitor.

I chose to spread a 40-volt range over my meter simply because the meter is a plate meter from an old Gonsett amplifier with a scale of 800 mA, but the basic movement is 500 µA. The 0.01 µF 150 VDC capacitor I used sets this 40-volt range, and the series resistance of the potentiometer established the voltage at the former zero end of the scale. Eliminating the capacitor provides a voltage range of 10 volts over the entire meter scale. However, because the line voltage here varies from about 105 to 122 volts, I decided to set my meter up to indicate a wider voltage range.

In operation, the 1N4007 acts as a half-wave rectifier and is fed directly into the cathode of zener diode 1N4764A, which is rated at 100 volts and 1 watt. This drops some voltage, and the potentiometer sets the beginning of the range of voltage to be monitored. Its value depends on the basic meter movement. One of the small surplus edgewise meters, usually 100 µA or 200 µA, is ideal, and most of us have several in the junk box. However, a larger meter enables closer measurement. The capacitor acts as a poor filter and its value determines the range of voltage over which your meter will indicate. This capacitor should have a working voltage of at least 150 VDC, but otherwise it is noncritical.

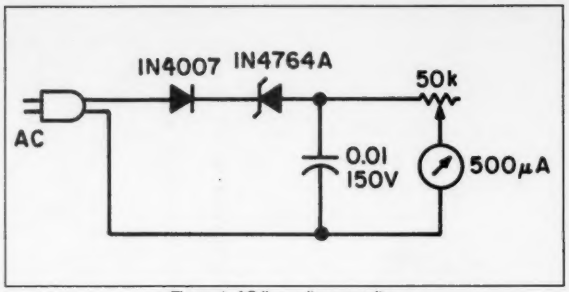

Figure 1. AC line voltage monitor.

Most surplus mail order dealers will have the parts you need at reasonable prices. However, go through your junk box first. Chances are you won't have to spend a cent to have an accurate line voltage monitor.

For Field Day or emergency operation using a motor-generator to supply AC power, this line voltage monitor will prevent accidental over- or under-voltage from being supplied to your expensive ham equipment.

To ensure accuracy of your monitor, use a digital voltmeter to measure the line voltage when adjusting your series potentiometer. Adjust the pot so your meter indicates the same voltage as the digital voltmeter. When choosing the potentiometer, remember that a 5 mA meter requires 200 ohms per volt; a 1 mA meter needs 1,000 ohms per volt; a 200-µA meter uses 5,000 ohms per volt; and a 100-µA meter needs 10,000 ohms per volt. Because the current through the meter is so low, a miniature trimpot will serve the purpose adequately.

The voltage set by the potentiometer is *not* the AC line voltage, it is the voltage range you choose to spread over the entire meter scale. As an example, my 500 µA meter required about 40,000 ohms, so I used a 50,000-ohm trimpot set at about 40,000 ohms. All parts can be mounted on a terminal strip fastened to one of the meter's mounting screws.

I just checked my monitor. I have almost 115 VAC! I hope you do a lot better!

J. Frank Brumbaugh KB4ZGC
Bradenton FL

Parts List

- 1 Plastic box, type used to mount switches and outlets in.
- 1 Duplex receptacle.
- 1 115-volt relay with normally open contacts.
- 1 Line cord long enough to reach from wall outlet to timer.
- 1 Short piece of line cord to reach from the inside of the box to the timer outlet, 8 or 10 inches long, with a plug on the end to plug into the timer.
- 1 Neon pilot light, 115 volt,(so you can tell that the charger is on).
- 1 Normally open push-to-start switch.

Above & Beyond

Continued from page 58

the TDA-7000 IF system ('10 GHz Fun,' October 1991)?" Yes, while the TDA-7000 chip proved to be difficult to obtain as new stock (my distributor was out of stock), I have received several tubes of TDA-7000 chips and have the PC board available. The cost is the same: $10 postpaid for the PC board, ready to drill, with a TDA-7000 chip. I usually toss in a few caps and other parts that can be used in each project, gratis.

Other kits available include the CW EPROM IDer for $12 postpaid. This kit comes with a programmed EPROM, such as "De Your call/B," or just your call. It was intended for use with the 10 GHz transceivers to run audio modulation on your WBFM transceiver while aligning or serving as a beacon mode of operation. A real "voice saver."

I still have quite a few 50 and 100 mW Gunn diodes, case style #111 and #118, that are 0.2 inches high, with 3/48 threads on the threaded heat sink negative terminal of the Gunn diode. The cost is $5 for a 50 mW device and $10 for a 100 mW Gunn devices. I still have a few 100 mW devices left but they are getting harder to test out. I do have brand-new low current—approximately 25 mW—devices for $10 each postpaid. These just came in. I always try to obtain hard-to-locate microwave components when I can find them as they tend to be hard to find and not available on a regular basis. The case styles of all Gunn devices are #111 & #118 (3/48 thread mount on heat sink portion of Gunn device, negative supply terminal).

Ellis comments that he has been licensed since 1941 and this will be his first activity above 440 MHz. He requests additional information on reading material and other related information. He picked up two Gunnplexers at Dayton but they did not have any horn antennas. Can you suggest a source of reasonably priced horns? Ellis, I don't have a source but I suggest you construct one as they are quite easy and very forgiving on dimensional errors and still work well. I will provide a folding pattern for a horn for 10 GHz next month.

Well, that's it for this month. As always I will be glad to answer questions covering microwave and related topics. For a prompt reply please send an SASE. 73 Chuck WB6IGP

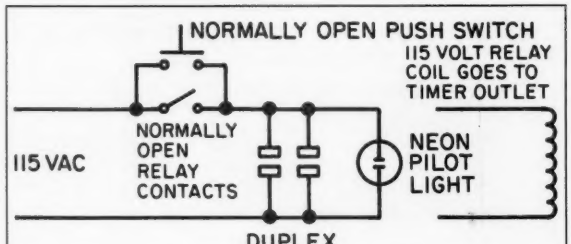

Figure 2. Timer controller.

Timer Controller to Protect Your NiCd from Overcharging

The instructions that came with my 2 meter HT call for a recharge time of 14, but not over 15, hours. My first thought was to use one of those 24-hour timers that turn lights on and off in your house, but in nine hours or so this type of timer turns back on again giving a second, unwanted, recharge. Here is a circuit that will prevent the timer from turning on again. See Figure 2.

Plug the timer and the device to be timed (charger) into the duplex receptacle. The output of the timer itself goes to the relay coil. A short cord coming out of the mounting box (and just long enough to reach the timer outlet) takes care of this.

Set the timer to the number of hours you want to charge (some things call for less time). Turn the timer to ON, then, with everything plugged in, just push the push-to-start switch to start the charging process. When the timer shuts off, the charging stops and you can forget about an over-charge. In the case of a power failure, all you have to do is push the start switch and the system will finish the charge. See Figure 2.

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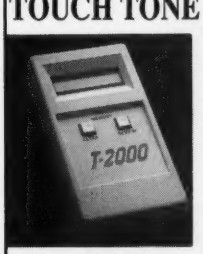

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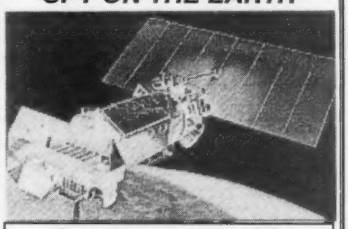

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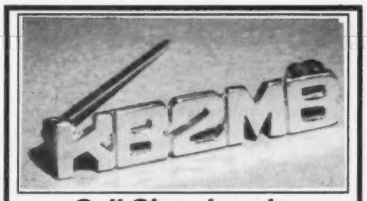

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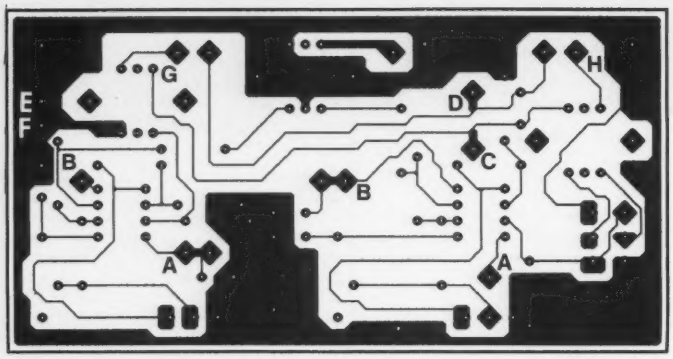

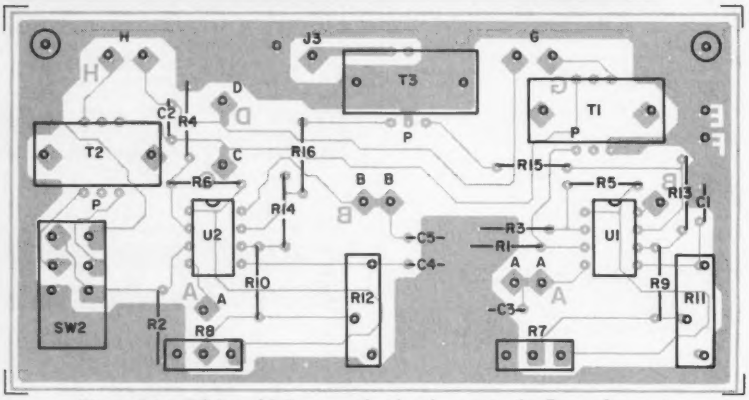

Figure 5.(a). PC board foil pattern for the phase unit. (b). Parts placment.

Noise Reduction Using Broadband Active Whip Antennas

Continued from page 40

your system working properly, a complete null of the signal should occur when the phase and amplitude of each channel are equally balanced.

This phasing unit is part of a system approach to improved long-wave reception. The combination of other benefits, as mentioned earlier, should be seriously considered for the best possible reduction in noise and enhancement of the desired signal.

Conclusion

It astonishes me how a simple system such as this can be so effective when dealing with problems such as noise, and help to open up opportunities for radio communication in the low frequency region. This system could probably be used with loop antennas and perhaps even more elaborate circuitry that would provide unusual types of reception patterns for further reducing noise and/or unwanted signals.

Some parts sources for this and other LF/VLF projects are:

LF Engineering, 17 Jeffry Road, East Haven CT 06513

BURHANS Electronics, 161 Grosvenor St., Athens OH 45701

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Ken Cornell's "Radio Scrap Book" Sixth edition, pg. 9.

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The DAIWA DP-830

Continued from page 27

played completely or incompletely on LCD." Hmmmm. Well, at least I knew there was a RESET switch. I pored over the pictorial and found the switch, accessible through a screw hole in the bottom of the chassis. Sure enough, it corrected the problem, just like the instructions said.)

Another somewhat startling aspect of the instruction sheet concerns the final page. Most of the instructions are printed with each page split down the middle, Japanese on the left, English on the right. However, at the bottom of the last page is a box filled almost entirely with Japanese, and what looks like a spot to fill in the serial number, date, and other pertinent information. The only English text in this box is the statement "This warranty valid only in Japan." Hmmmm. I did notice a separate Warranty Registration Card, discussing a one-year limited warranty, ready to be sent to Electronic Distributors, Inc., in Virginia. I gave EDCO a call, and found: 1) some very friendly people; 2) that the DP-830 has a one-year warranty; and 3) that EDCO performs DAIWA warranty repairs right in Virginia—you won't need to take your wattmeter to Tokyo for repair, UPS can take it right to Virginia.

Not that that appears likely. The DP-830 looks like a unit that's well-built enough to last for years, and well-designed enough to make you want to hang on to it for that long. The DP-800 series is distributed by Electronic Distributors Co. of Vienna, VA, and is available anywhere DAIWA products are sold.

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First Things First

I want to start this month's column with a correction. Somehow, I managed to leave out a very important character in my instructions for AD8I's WP (White Pages) server. That character is the question mark that should follow the callsign being queried. So, here are the corrected instructions:

```
SP WP @ AD8I.#CMH.OH.USA.NA
QUERY     (this is the subject)
call_1 ? <cr>
call_2 ? <cr>
...
call_n ? <cr>
^Z (control+z) <cr>
where:
<cr> is carriage return—enter on PC
 compatibles
call_1, call_2, etc. are the calls
subject to query—more than one
may be included, but be sure that
each is on its own line, as shown.
```

Sorry for any inconvenience this error might have caused, and thanks to AD8I both for pointing it out, and for running the WP server as a service to the amateur community.

Internet Update

Boy, did I get a lot of mail about Internet access to and from packet. Lots of letters and e-mail, much of it with questions about going from the Internet mail system to AX.25 packet. Well, this is possible, but . . . the difficulty here is the amount of time required on the part of the administrator of the connection. In the case of AX.25-to-Internet, the gateway routes the traffic onto land lines. But, going the other way means that land line traffic ends up coming out of a radio, and the control operator of that transmitter needs to be concerned with what goes out over the air. This means that each message must be checked for legality, a tedious process to say the least. You can see why there aren't too many gateways in operation. I have used such gateways in the past, but I have been told these may no longer be operational. I plan to do some digging and report back here if I can find an Internet-to-AX.25 route. In the meantime, if any of you know of a path that works, please let me know! You can reach me care of this magazine, electronically on MCI Mail (jsloman), or CompuServe (71221,1143).

Portable Packet

Packet stations that can be moved around are particularly useful for emergency communications. Packet's potential to pass critical information to and from EOCs (Emergency Operating Centers) during disasters has not been well exploited. Why? A large part of the problem is planning. If the local ARES or RACES organization has not developed a packet network, it is unlikely that a disaster situation will bring about the miraculous cooperation of the area's packet users. Planning and *testing* of the emergency network is essential if it is to be useful when disaster strikes.

One thing the individual ham can do is to build a portable packet station that will be ready when needed. To be useful, a portable packet station need not fit in a shirt pocket or be built into a briefcase—though there is nothing saying you can't have fun building something like this. Let's look at the elements of a portable packet station, and some choices.

Battery Operation

During a disaster, commercial power may be unavailable for some time. This makes battery power critical. A low power (5W) packet station based on a handheld and portable computer can be run from a storage battery for quite a long time. There are several types of batteries suitable for this application. Here are a few:

Alkaline: These batteries have some obvious problems. They are primary, rather than secondary, meaning they cannot be recharged. They are used and then thrown away. They are costly, particularly when you consider their disposable nature. But, alkalines have some good aspects too, particularly for emergency service. They are readily available—there is almost nowhere that a set of D cells cannot be purchased. They are very high capacity, offering a long battery life, which somewhat offsets their high cost. They have an excellent shelf life, and can be left sitting around for quite a long time and then pressed into service. Battery holders for the various sizes are readily available, making battery pack building easy. While I wouldn't suggest using alkalines as the primary power source for a portable station, having an alkaline pack as a back-up is an excellent idea.

NiCd: Nickel-Cadmium batteries, like those used in your handheld's battery pack, can be used for this type of operation. They have the advantage of an extremely high *power density*, the battery equivalent of power-to-weight ratio. Pound for pound, NiCds are one of the most powerful types of battery available. These otherwise excellent batteries have two negative points, though. First, they are finicky about charging and can be easily damaged by overcharging or overdischarging. They suffer from *NiCd Memory*, the tendency to lose the ability to charge to their full capacity if they are not routinely discharged. These qualities make careful maintenance of NiCds essential—particularly if most of the time they sit idle. In an emergency, they will be expected to work hard; will they?

The second obvious problem is cost. NiCds can be very expensive. If you happen to find some NiCd packs—in good condition—cheap, say, at a hamfest, it is probably worth using them. Keep in mind, though, that you will need to carefully charge—and periodically discharge—them to insure they will be ready for use.

Sealed Lead-Acid: Lead acid batteries are an excellent choice for portable emergency operation. Their main disadvantage is weight—they are substantially heavier than NiCd batteries of the same capacity—but their advantages make lugging the weight worthwhile. Generally speaking, there are three kinds of lead acid batteries that are useful for portable operations.

Gel Cells: The "gel" in gel cell refers to the gelled electrolyte used in these batteries. The acid is stored in the form of a gel, allowing the batteries to be mounted in various orientations without the possibility of leakage. Compare this to liquid electrolyte, as in a car battery. As with all the other batteries, there are good and bad things about gel cells. First, the good stuff: They are readily available. Since these batteries are used in all sorts of commercial applications—alarm systems, battery backup power, etc.—the surplus market is overflowing with them.

Careful shopping can turn up some good deals on these guys, but you must be careful. Gel cells do not take well to being fully discharged for long periods. A dead gel cell is probably really dead. The easiest and first test that should be done is to pick up the battery and shake it. If it rattles, it's probably good for a paperweight—but not as a battery. Carry a volt meter with you when you shop. If the terminal (no load) voltage is at least 7 volts, you can probably charge the battery. If it is less, give it a pass—you will find others. Another useful test is a 12-volt lamp (like a back-up light from a car) with a pair of leads soldered to it. This will allow you to test the battery under load.

If you find some good batteries at a good price—12V 5 Ah packs should cost from $5 to $15 surplus—treat them right. Gel cells require some care in charging. Never overcharge them or let them become discharged for extended periods. It is a good idea to buy or build a charger designed especially for these batteries.

Deep Cycle Marine: These sealed lead acid batteries are used on small boats for engine starting and electrical power. They produce impressive—and potentially dangerous!—currents. They are easy to charge, and quite forgiving about maintenance. You are unlikely to find one surplus, and new they will run you from about $50 to $80. While you will not want to carry this battery around, a station that will be set up in an EOC or other fixed location will run from one of these for a long time—even with a 15- or 20-watt transmitter.

Gates Cyclon: The Gates Cyclon battery is a unique lead acid design. It uses a special lead matrix instead of traditional plate design and comes about as close as you can get to a "dry" electrolyte. The design of these batteries makes them much less vulnerable to charging damage. Gates batteries are much less common than gel cell types, but you will still find them among the gel cells at hamfests. Unlike gel cells, Cylcons with zero terminal voltage are not necessarily dead in a permanent way. A high voltage (15-20V) at low current (30-50 mA) will rejuvenate a battery that does not want to take a charge. Normal charging of Cyclons is constant voltage; that is, 13.8V is applied to the battery at any current. The battery itself limits the current as it charges. Charging currents as high as 20 C (C= capacity of the battery in Ah or Amp Hours). This means, for example, that a 5 AH battery could be safely charged in less than 10 minutes if you could actually deliver 200 A at 13.8V to it. Practical considerations prevent this, but the point is: This battery can be charged by just about any regulated 13.8V supply. These batteries are not particularly lightweight, but they are manageable, even if they must be carried around. This is my battery of choice for emergency and portable operations.

Your Car: The battery in your car will make an excellent power supply—with a built-in charging system. If you intend to operate mobile, you could do worse than your car's electrical system.

The Terminal Node Controller

Obviously, portable operation requires a suitable TNC. Once again, while tiny is nice, it isn't absolutely necessary. The size must be manageable, but unless you intend to carry the station on foot, nearly any simple VHF TNC will do the job. In fact, current draw is more important than size. One way to limit the current required by the TNC is to choose one with a small memory size. The memory is used to store messages for the TNC's mailbox, and is really unimportant for a portable station since the mailbox is unlikely to get much use. The best way to determine if the TNC is appropriate is to try using it, portably, in a non-emergency situation. Field Day is an excellent opportunity to give the station a workout. You can also get some idea of the TNC's current consumption by checking the manufacturer's spec sheet.

My own portable station uses an HK-21 Pocket Packet TNC from Heathkit. While this unit is very small, which is nice, it does have some problems. First, power input is through a tiny coaxial jack mounted on the side. This is much more vulnerable than I would like. The data connection is through a 25-pin D connector on the back of the unit. The mating connector is nearly half the size of the unit itself. When checking out a potential TNC, keep these connections—and the connection to the radio—in mind. Remember that you will want to build a reliable set of cables (this is very important) for your station. Make sure the TNC's suite of connectors allow this.

The Data Terminal

A packet station needs some sort of

data terminal. A portable station needs something that will run from batteries. When I built my first packet station, the best choice was the Radio Shack Model 100. This is a notebook-sized computer with an eight-line by 40-character display. While this is a noticeable limitation, the Model 100 does have the distinct benefit of requiring very little current. The unit will run for about 20 hours of intermittent use on four AA cells. You will find many used Model 100 computers listed for sale on packet and at hamfests. The other Radio Shack computers from about the same era—the Model 200 and Model 600 computers—are also good portable terminals.

But today's notebooks and laptops are so much more capable that these older computers don't seem very attractive anymore. One popular machine from just a few years ago is the Toshiba T1000 battery-powered notebook computer. These units feature floppy drives and much better displays than the venerable Model 100. Powering some of these laptop and notebook computers can be a little tricky, though. You must either use the supplied rechargeable batteries, or carefully supply regulated current to the machine from your main battery supply. If you do use your main supply, make sure you know what the computer expects.

The Radio

The handheld is the obvious choice for portable packet. Modern handhelds are frequency agile, very power efficient when receiving, and readily available—but there is no reason that you cannot use a mobile radio if your station is to operate from either a vehicle or in a fixed position. Whichever radio you choose, make sure that it is a reliable one. While you might save some money buying an older radio, you might also end up without a working station when you really need it. Be sure, also, to consider scaling your battery supply to its current requirements. For mobile rigs, consider a separate battery.

The Cables

The cables that interconnect the components of your station—power, data, audio, etc.—should be of the highest quality. Carefully choose well-made connectors and cable and carefully build *two* sets. This way, if one fails you will have a backup. Be sure to make the cables long enough to cover all the possibilities—better too long than too short.

A Carrying Case

You will need some sort of container for your equipment. It should be easily packed and unpacked, weatherproof, and protect the equipment inside from the bumps and bangs that it is likely to receive while being moved around. This case can range from a fancy aluminum briefcase to a plastic tub with foam inserts. The key is protecting and transporting the equipment inside.

Miscellaneous Equipment

A portable packet station, like any portable radio station, requires other equipment to be useful in an emergency. Don't forget that at night you will need some sort of lighting. Look at the lighting equipment available for recreational vehicles—this stuff runs from 12V and there is quite a variety. I found an old "high intensity" desk lamp and bypassed the transformer inside, connecting the 12V directly to the lamp. If you do this, leave the transformer in place for weight.

The other equipment is somewhat "low-tech"—pens and paper. Make sure you have lots of stuff to write with—you will need it. Also consider carrying a first aid kit and some food.

A portable or mobile packet station can be fun to build and operate, and in an emergency it can help your local disaster relief organization get information in and out of an affected area. Please let me know if you build a station, or if you have already built one, and what you use for the various parts. If you have some tips you can share, I'll be glad to pass them on. 73 de N1EWO.

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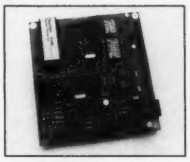

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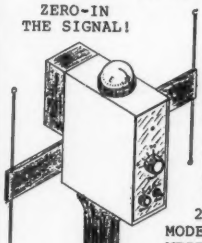

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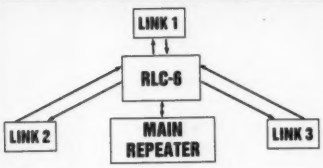

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The CQ All Schools Net From The Pentagon

Over the last five years my students and I have had unqualified fun meeting new and interesting people on the CQ All Schools net. Part of the fun is that you really never know who is going to pop up at the other end of that contact. We've enjoyed contacts with thousands of ham radio operators from every walk of life . . . engineers, architects, teachers, students, doctors, pilots, clowns, herpetologists, dentists, and astronauts. Of course, every contact provides the classroom teacher with the ability to explore in greater detail the enrichment that these different backgrounds can provide educationally to the children.

Gordon West WB6NOA and I were especially delighted one day when we heard K4AF, the Pentagon Amateur Radio Station, check in to our net. Pat WJØT and Mike KD4IIZ proceeded to tell the school children who were standing by on frequency all about the Pentagon. The first fact that surprised all the children was that this unusual building is located in Arlington, Virginia, not in Washington, D.C.

I immediately seized the opportunity to launch an "extra credit" project on the Pentagon. By the time Pat and Mike tried to contact us on the net again, we had accumulated a roomful of reports, dioramas and pictures of the Pentagon. Since our net meets on 28.303 MHz, we often had a hard time hearing K4AF really well. However, other schools across the country who were checked in on the net told me how much they were enjoying the contacts.

It was amazing to learn all the myths there are about the Pentagon. I must admit that even I had a new appreciation of the size of the building after listening to some of the children's reports. The Pentagon, headquarters of the Department of Defense, is one of the world's largest office buildings. It is twice the size of the Merchandise Mart in Chicago, and has three times the floor space as the Empire State Building in New York. The national Capitol could fit into any one of its five wedge-shaped sections.

My 6th, 7th and 8th graders and I were enjoying our research about the government and the Department of Defense when Pat extended an invitation to visit the Pentagon in person. Needless to say, we were incredibly excited about this new adventure. Pat and I agreed that it would be a terrific experience for me to conduct the CQ All Schools net from the ham shack at the Pentagon while I was there. It's wonderful to see how the students rally to become involved in exciting projects like this. It was the idea of my ham radio students to invite a ham friend of mine to be present with the youngsters at the ham shack in our room at Intermediate School 72 in Staten Island, New York, so that they could contact me on the net.

My good friend John Anzivino WA2QYX, who is terrific with children, agreed to help us out by manning the station at our school. John has been to our school many times to demonstrate ATV with fellow BEMARC club members. When the big day came on June 11th, my principal, Barbara Glassman, was extremely impressed with the way that John handled the packed classroom of children. He conducted mini-lessons about the Pentagon and about radio propagation, explaining the problem of a 10 meter contact between New York and Virginia. He made a wonderful instructor and I will always be grateful for his support.

At the Pentagon

My visit to the Pentagon was incredible. I loved it! It was informative and totally enjoyable, thanks to the hospitality of Pat's wife, Mary, and the members of the Amateur Radio Club there. I learned that the Pentagon is really a city unto itself. About 23,000 employees, both military and civilian, work there. They ride past 200 acres of lawn to park about 10,000 cars in four parking lots; climb 150 stairways or ride 19 escalators to reach offices that occupy 3,705,793 square feet. While in the building, they can walk down 17-1/2 miles of corridors, tell time by 4,200 clocks, utilize 280 rest rooms, consume 30,000 cups of coffee, 6,000 pints of milk, and 5,000 soft drinks daily.

Over 200,000 telephone calls are made daily through phones connected by 100,000 miles of telephone cable. The Defense Post Office handles about 130,000 pieces of mail daily. Various libraries support the personnel in research and completion of their work. The Army Library alone provides 300,000 publications and 1,700 periodicals in various languages.

The Department of Defense is managed by a civilian Secretary of Defense appointed by the president of the United States. The highest ranking military position is that of the Chairman, Joint Chief of Staff. While not a member of the Department of Defense, the Coast Guard is at all times one of the five Armed Forces of the United States.

Following an exciting tour of some of the highlights of this most unusual building, Pat escorted me up to the fifth floor where the K4AF station is. Mike KD4II and Major Dick Lum NH6E were there to greet me. Both Mike and Pat worked diligently with me to log in the schools and ham operators who were standing by for the net. I had arranged with John, back at my school in Staten Island, to switch from 10 meters to 20 meters if we couldn't hook up in 10 minutes. Unfortunately, I was never able to hear the kids at my school, but they were able to hear me calling them and speaking to other school children.

Jim Wilmerding N4MDC is our net control in New Orleans, Louisiana. He did a super job on June 11th relaying messages for us. So often, I find myself thinking how nothing really worthwhile ever happens in ham radio with just one person. Over and over again, I am impressed by the way hams rally to help each other for the greater good of a project or a cause. The net ran for 90 minutes that day, with scarcely a pause between check-ins. We spoke to a high school in Toronto, a ham in Bermuda, a snake collector in Florida, a French high school student in Ottawa, and an engineer at CBS TV in Los Angeles.

In true ham tradition, Nancy Bucher N6XQR had arranged for a radio to be set up in the classroom of the sister of the Chairman of the Joint Chiefs of Staff, General Colin Powell. With the help of local hams in Santa Ana, California, like David Corsiglia WA6TWF and Mary Williams AB6CZ, Nancy was responsible for the terrific contact between Mrs. Berns' 5th grade class and me while I was running the net from the Pentagon that day. With the help of lots of dedicated hams, we plan to have follow-up exchanges between our schools.

I thoroughly enjoyed conducting the CQ All Schools net that day from a very special location. I'd especially like to thank Mike Cash for being such an able assistant with the log book, and Pat Oliver for all his efforts in arranging my visit. When I arrived back in school the next day, I was greeted by a group of eager and highly motivated children who couldn't wait to tell me what happened in my room as they were listening to the net, and to find out about all the things I had experienced at the Pentagon. It's so uplifting when kids get all excited about good things.

The Pentagon Amateur Radio Club has 56 active members with 40 percent of them being Extra class. They have a full packet radio station along with HF and UHF capabilities. The Air Force Morale Support Organization set up and maintains the very well equipped station.

Whenever I go on an interesting field trip such as this, I'm always on the lookout for material to bring back to other teachers at my school. This time I brought back some literature written about the Pentagon for the social studies teachers, the same literature translated into French, Spanish, German and Japanese for the foreign language and ESL (English as a second language) teachers, and structural information and statistics about the building itself for the science department. It really wound up becoming a school-wide project, which is great because it generates the children's interests in many different areas, and brings some worldliness and relevance into their school curricula.

Please join us this fall for the CQ All Schools net on Tuesdays and Thursdays at 16:30 UTC on 28.303 MHz and share the fun of introducing youngsters to all that is exciting about amateur radio. 73

Photo A. Left to right: Pat WJØT, Mike KD4IIZ and Carole WB2MGP at the Pentagon ARS.

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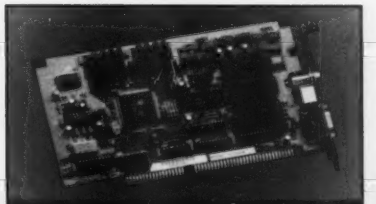

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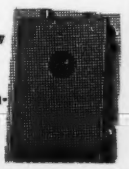

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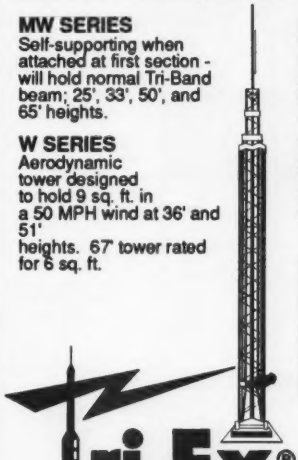

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Number 21 on your Feedback card

Low Power Operation

Mike Bryce WB8VGE
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Why Use a Bidirectional Power Meter?

A bidirectional power meter will instantly tell the user how much RF power is going out to the antenna and how much power is being reflected back to the transmitter. A bidirectional power meter is NOT an SWR indicator in itself.

However, by using a monograph, you'll be able to get the exact standing wave ratio. But you really don't need the monograph either, as experience and common sense will give you a really good idea of what the standing wave ratio is by simply monitoring the two meters. Did I say two meters? Yes, a bidirectional power meter usually has two meters: both reading RF at the same time, but from both (forward and reflected) directions. One meter could be switch-selected, but somehow this takes away some of the advantages of watching both meters.

With two meters, as the SWR increases the reflected power meter will show an increase in deflection. Likewise, as the transmitter is matched to the antenna, the reflected power reading will go down. Ideally, it should read zero watts reflected, with an SWR of 1:1.

With a bidirectional power meter, you don't have to adjust a calibration control or select a power scale (within the design of the meter) to get a reading.

If all of this sounds too good to be true, there must be a catch somewhere.

Well, there can be a trade off when it comes to frequency spread if the design is deficient. This is of course true in just about any RF power meter circuit. But a directional RF bridge can be a real challenge. Besides that, you have to come up with two matching meters. I've always been surprised that the prices of analog meters have not fallen due to the number of digital readout and displays you see used today. Instead, analog meters have soared out of price. And, of course, everyone yells and screams about getting all the parts together anyway.

Building a Bidirectional Wattmeter

Thanks to Kanga Products of England, you can have your own bidirectional RF power meter for less than $50, or maybe even less than that depending on how much junk your (or some one else's) junk box has in stock. Oh yes, not to worry about British pounds and U.S. dollars; Kanga Products has a U.S. sales agent here in the states.

The kit as it comes from Kanga is very basic. There is no PC board. You get a bag of parts and several sheets of instructions. The instructions for the project are very meager. Although it is definitely not a hard kit to build, it's not a Heathkit by a long shot. The Kanga kit is not for the novice builder. If you're looking for (or need) step-by-step instructions, you won't find them here. If the bidirectional RF power meter is a bit more than you can chew, then you can return it *as supplied* for a full refund.

The meters (and you'll need two) are NOT included. You can purchase them for $5 each and, unless you have some in the junk box, it would be a good idea to get the meters with the kit.

Although the meters specified for use with the kit are for 50 micro amp meters, the ones supplied to me with my kit are in fact 100 microamp meters. They work just fine, with perhaps just a slight trade off in low-low power readings. I can measure down to 1 watt and still have full-scale deflection with the 100 micro amp meters. The meter face reads 0 to 20 watts, as they come. The meter's scale will need to be changed, or you can calibrate the RF meter to use the scale as is. It's up to you and, either way, it won't effect the operation of the bidirectional RF meter. I choose to use the meter(s) face as is.

A full-size drawing of the bidirectional RF power meter is included. I used this drawing only to construct the circuit. The schematic is clear, yet at the same time a bit discomforting. The pictorial made more sense to me during construction than did the schematic. I must be getting older or something.

Looking at the schematic, the bidirectional wattmeter is really nothing more that two transformers. If you feed RF into connector RAS, power passes through the transformers. Just about 99 percent of the power goes to the other connector, RBS, and to your antenna. The one percent comes out of connector RDS and into its 50-ohm resistor termination.

If your antenna does not present a perfect 50-ohm impedance, some power will be reflected and will pass backwards through the hybrid from RBS to RAS, with 99 percent of this reflected power reaching RAS. The remaining one percent is diverted to connector RCS and dissipated in its 50-ohm resistor. In both cases, the resulting RF is then rectified and displayed on the two meters. One will read REFLECTED power and the other FORWARD power, both at the same time.

Dick Pascoe GØBPS, operator of Kanga products, informs me the coupling factor is about -21 dB with 12 turns of wire on the secondary of the transformers. The meter was measured at -21.59 +/-0.01 dB over 1.5 to 50 MHz. This flatness is excellent and is due mainly to the core material used in the transformers. No, I don't know what type or kind they are. They're supplied in the kit.

Plots of through-path attenuation are less than 0.1 dB over 1.5 to 50 MHz. The forward termination dissipates 0.69 percent of the forward power. The bidirectional RF meter may be used with the transmitter up to 150 watts output.

With only a handful of parts, construction goes very quickly after you have both transformers wound and the stand-offs in place. A large soldering iron or soldering gun will prove very handy when soldering to the SO-239s.

You'll need to drill two large holes to mount the SO-239s to the box. There are also several insulated stand-offs that you'll be required to mount. I found my battery powered drill priceless in drilling these holes. Of course, a drill press would be fine, but you're cramped inside the box. I had to hold the transformer with one hand to find the exact place to put the stand-off with the other hand. The small drill worked beautifully. The die-cast aluminum box holding the electronics cuts and drills very easily. If you want to try and duplicate this circuit (without buying the kit), you must enclose the transformers in some type of metal box. You must shield these transformers; if you don't the stray RF will cause errors. Double-sided PC board material would be an excellent choice to house the transformers. As for the cores, I'd try my luck with a T-60-6 core.

I built my meter in a small case I picked up at Dayton several years ago. This clamshell case is easy to work with and provides a great deal of extra RF shielding, both to the RF pickup transformers and the two meters. I left the back of the case open to allow easy hook-up for the "in" and "out" SO-239s. If you wanted to, you could remote the pick-up sensors and run a multiwire cable back to the meters. I have not tried this. It should work without trouble. I would not run the cable more than three or four feet at most.

Calibration

You'll need a transmitter and a 50-ohm dummy load to calibrate your bidirectional meter. Calibration is easy. You change one resistor for each meter. A 22k resistor will result in a 5-watt full-scale deflection. Using a 56k resistor will provide for a 20-watt full-scale reading. This will provide better than 10 percent accuracy. You can also use a fixed resistor and trimmer for greater accuracy, but you'll need laboratory equipment to set up everything.

All you have to do is apply RF with the external RF wattmeter in line, then verify that the bidirectional wattmeter reads the same forward power. Reverse the two coaxes and check the reflected meter's scale. It's that easy and it's done.

I'm all and all very happy with the bidirectional wattmeter from Kanga products. I've been surprised by how well it covers different frequencies without introducing errors in the readings. I've used it up to 144 MHz with great results. On frequencies up to 432, I've noticed about 1.8 SWR insertion with the meter. It still works and it's a great way to tell the SWR on the antenna, and if there is anything coming out of the 432 transmitter! Not bad for a handful of parts!

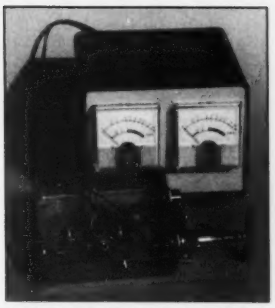

Photo A. The Kanga Products' bidirectional RF power meter.

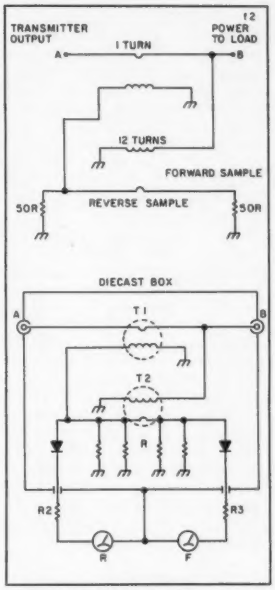

Figure 1(a). Schematic diagram of the Kanga Products bidirectional power meter. (b). Pictorial layout of the power meter.

You can purchase the Kanga kit from Bill Kelsey N8ET, 3521 Spring Lake Drive, Findlay OH 45840. The price is $35 for the kit plus $3.50 for shipping. Ohio orders please add 5.5 percent state tax. Bill takes MC/Visa or check/money orders. Bill also carries other Kanga products. If you want a catalog, you MUST include an SASE.

Next month, as winter gets a grip on the Ohio countryside, I'll take a second look at the Ten-Tec Argonaut II deluxe QRP transceiver. Ten-Tec listened to our requests and fixed some bugs crawling around in the Argo II. Watch next month for a re-visit with the Argo II.

Number 22 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

*Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check **Special Events** in **Area #11** on our **BBS (603- 924-9343)**. for listings that were too late to get into publication.*

OCT 3-4

BOXBORO, MA The 1992 New England ARRL Convention will be held at the Host Inn and Conference Center (formerly Sheraton), from 9 AM-5 PM Sat.; 10 AM-2 PM Sun. This Convention is being presented by ***The Federation of Eastern Massachusetts Amateur Radio Associations. Tel. (617) 631-7388.***

OCT 4

HUNTINGTON, IN The Huntington County ARS will sponsor its 4th annual Hamfest at the PAL (Police Athletic League) Club from 8 AM-3 PM. Set-up at 6 AM. Indoor Flea Market. Free Parking. VE Exams. Handicap accessible. Advance tickets $3.50, $4 at the door. 8' tables are $5 on a first-come first-served basis. Talk-in on 146.085/.685 and 448.975/443.975. For tickets and tables contact ***Ray Tackett KC9DZ, 420 Market St., Andrews IN 46702.***

OCT 9-10

AUGUSTA, GA The ARC of Augusta will sponsor a Hamfest at the Civic Center, 601 7th St., downtown, exit 46 on I-20 from 6 PM-9 PM Fri., and from 8 AM-5 PM Sat. Set-up 3 PM Fri., 6 AM Sat. Free parking. Handicap accessible. RV Parking. VE Exams: registration at 12 noon, testing at 1 PM; bring 2 forms of ID, Novice exam is free; upgrades bring original license, copy, and $5.40. Flea Market. Admission $4 in advance, $5 at the door. Children 12 and under free. Tables $10. Talk-in on 144.89/145.49. For tickets/tables, send SASE and check to ***Paul Murray N4XTD, Burden Lake Rd., Aiken SC 29803.***

OCT 10

BALDWINSVILLE, NY The Radio Amateurs of Greater Syracuse (RAGS) will hold its 37th Hamfest at the Tricounty Convention Center from 9 AM-4 PM. Flea Market set-up is 4-10 PM Fri., and 6:30-8:30 AM Sat. All indoors. Wheelchair accessible. Pre-register for VE Exams. There will be commercial vendors, computers, tech talks, contests. Restaurants, movie theaters and snack bars are all on the premises. Talk-in on 146.31/.91 MHz. For inquiries call ***(315) 469-0590.***

GRAND FORKS, ND The Forx ARC will hold their Hamfest in the Grand Forks Civic Auditorium, 615 1st Ave. North. Swapfest with tables provided. VE Exams. Forums. Admission $4. Talk-in on 146.34/.94. Contact ***Gerry Nies NØNGW, 1815 University Ave., Grand Forks ND 58203. Tel. (701) 775-5066.***

HUNTINGTON, WV W5YI testing sessions, sponsored by the Tri-State ARA, Inc. VE Team, will be held at Our Lady of Fatima church school class rooms, 545 Norway Ave., at 10 AM. Bring a photo ID, a copy of current licenses or original CSCE, and a completed Form 610. Form 610 will be available at the test session. No pre-registration necessary. Arrive by 9:15 AM to register, and to have ID and Form 610 checked prior to examination. For info call ***Jim Baker K8KVX, (304) 736-6542.***

KITSAP, WA The North Kitsap ARC will present their 1st annual Hamfest/Swapmeet, at the Kitsap County Fairgrounds, President's Hall (northwest corner of Fairgrounds and Nels Nelson Rds.) from 9 AM-4 PM. Admission $4 at the door. To reserve tables, contact ***Matt Amis AA7LP, 2196 California Ave. E., Port Orchard WA 98366. Tel.(206) 871-7099.***

TEANECK, NJ The Bergen ARA will hold its annual Fall Hamfest from 8 AM-2 PM at Fairleigh Dickinson University. From the east, follow Rte. 4 west to River Rd. exit. From the west, follow Rte. 4 west to River Rd. exit. Admission $2. XYL and harmonics free. Sellers $10 per parking space. Space with power $20 (pre-registration required). For Hamfest info,—contact ***Jim Joyce K2ZO, (201) 664-6725.*** Talk-in on 146.190/.790 and 145.620 simplex. For VE Exams info, call ***Pete Adely K2MHP, (201) 796-6622.*** Please, no calls after 10 PM.

OCT 10-11

EL PASO, TX The International Hamfiesta will be held at the Texas National Guard Bldg., 9100 Gateway Blvd. North, on Sat. from 8 AM-5 PM, and Sun. 8 AM-3 PM. RV parking, no hookups. Admission $5 in advance, $6 at the door. Tables $5. Tailgate spaces $5. Seminars, QCWA Breakfast. VE Exams both days. Talk-in on 146.88 rptr. Contact ***Clay Emert K5TRW, Box 31628, El Paso TX 79931. Tel. (915) 859-5502.***

MEMPHIS, TN The Greater Memphis Amateur Radio and Computer Show, MemFest 92, sponsored by the Mid-South ARA, will be held at the Mid-South Fairgrounds in the Pipkin Bldg., Sat. 9 AM-4 PM, and Sun. 9 AM-2 PM. Admission $5 at the door. VE Exams Sat. and Sun. 9 AM-12 noon. Flea Market tables $20 per table for the weekend; contact ***Steve Cheeseman NX3W, 3290 New Getwell, Memphis TN 38118. Tel. (901) 365-6621 (W), (901) 368-6781 (H).*** Exhibitors contact ***Nita Woofford N4DON, 2966 Cordell, Memphis TN 38118. Tel. (901) 363-4971.*** Talk-in on 146.28/.88 and 449.00/444.00.

OCT 11

WAUKESHA, WI The Kettle Moraine RAC Inc. will hold its 14th annual Ham/Computer Swapfest at the Waukesha County Exposition Center, Hwys J & FT. All indoors from 8 AM-1 PM. Advance tickets $4, $5 at the door. Reserved tables are $5 for each 4' length (admission ticket required). Reservation deadline is Oct. 3rd. Vendor set-up at 6 AM. The Badger Exminers will conduct Exams. For reservations, send a check payable to ***KMRA Swapfest, P.O. Box 411, Waukesha WI 53187-0411.*** Please include an SASE. Waukesha County Airport is next door for fly-ins.

OCT 17

GRAY, TN The Appalachian Fair Grounds, off I-181, will be the location for the 12th annual Tri-Cities Hamfest, sponsored by the Kingsport, Bristol, and Johnson City Radio Clubs. Drive-in indoor and outdoor Flea Market space is available. RV hookups. Admission $5. Mail inquiries to ***Tri-Cities Hamfest, P.O. Box 3682 CRS, Johnson City TN 37602.***

SCOTCH PLAINS, NJ The Tri-County Radio Assn. will hold their TCRA Hamputer Fest, from 8 AM-2 PM, at the Union Catholic Regional High School (on Martine Rd.). Donation $4. Children under 12 admitted free (must be accompanied by a parent). For walk-in VE Exams, please arrive by 9:30 AM. Bring check for $5.40 made out to "ARRL VEC" for all except Novice exams. Also bring your original license and a Xerox copy; 2 forms of ID; pencils and a pen. Reservations required for: Tailgating $8; Tables $10 ($12 with power). Contact ***Dick Franklin W2EUF, 310 Indian Trail, Mountainside NJ 07092. Tel. (908) 654-4943.***

OCT 18

CAMBRIDGE, MA A Tailgate electronics, computer and amateur radio Flea Market will be held at Albany and Main Streets from 9 AM-2 PM by the MIT Electronics Research Society, the MIT Radio Society, and the Harvard Wireless Club. Free off-street parking. Tailgating. Admission $2. Sellers, $8 per space at the gate, $5 in advance (includes one admission). Set-up at 7 AM. For space reservations/info, call ***(617) 253-3776.*** Mail advance reservations before Oct. 5th to ***W1GSL, P.O. Box 82 MIT BR., Cambridge MA 02139.*** Talk-in on 146.52 and 449.725/ 444.725—pl 2A—W1XM rptr.

CENTRALIA, IL The Centralia Wireless Assn., Inc., will hold its annual Hamfest at the Kaskaskia College Gymnasium, 3 miles Northwest of Centralia IL, starting at 8 AM. Set-up is at 6 AM. Free parking. Reserve your tables in advance @ $1/foot. Bring your own tables @ $.50 per foot. Tailgating free. Admission/Main Prize tickets are $2 each or 3/$5, purchased in advance or at the Hamfest. For table and space reservations, contact ***Bud King WA9U, (618) 532-6606.*** Mail ticket orders with an SASE to ***Centralia Wireless Assn., Inc., Hamfest Tickets, P.O. Box 1166, Centralia IL 62801.***

KALAMAZOO, MI The Southwest MI AR Team and the Kalamazoo ARC will co-sponsor a Hamfest at Kalamazoo Central High School. Take US 131 to M-43 east to Drake Rd., then north to the school. Doors open at 8 AM. Set-up at 6 AM. Advance tickets $2, $3 at the door. Free parking. No testing. Tables are $1.50/ft, 4 ft min. Send requests and payment with SASE before Oct. 7 to ***Gary Hazelton KB8PL, 75075 M-40, Lawton MI 49065.*** Make checks payable to ***Kalamazoo Hamfest.***

MARION, OH The Marion ARC will present its 18th annual Heart of Ohio Hamfiesta/Computer Show at the Marion County Fairgrounds Coliseum from 8 AM-3 PM. Free parking. Advance tickets $4; $5 at the door. Tables $8. Talk-in on 147.90/.30 rptr. Contact ***Dan Burns N8JMF, 844 Robinson, Marion OH 43302. Tel. (614) 382-2384*** M-F after 4 PM, or S-S all day.

MILAN, OH The 1992 FARA Hamfest/Computer Fair will be sponsored by the Firelands ARA, indoors at the EHOVE Vocational School, just 1/4 mile north from Ohio turnpike Exit 7 (I-80/90) Rt. 250. Mobile Check-in is on 146.805/.205 MHz. Advance tickets $3, $4 at the gate. 8' tables $8 ea. Set-up Sat. 7 PM-10 PM; Sun. 6 AM. Gates open at 8 AM. Packet seminar/demonstration. ARRL Awards rep will be on hand to certify hams for DXCC. Ohio's largest factory outlet mall is across the street. A discount coupon book is provided for all ticket holders. Contact ***Gene Hutchins, 45 Welton Ave., Norwalk OH 44857. Tel. (419) 668-5795.***

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot, Flushing Meadow Park, 47-01 111th St. Vendor set-up at 7:30 AM. Buyers admitted at 9 AM. Free parking. Admission: Buyers $5, Sellers $8 per space. Talk-in on 445.175 NB2A rptr., 146.52 simplex. Call at night, ***Charles Becker WA2JUJ, (516) 694-3955; Arnie Schiffman WB2YXB, (718) 343-0172.***

TUCSON, AZ De Anza Drive-In, 22nd St. and Alvernon Way, will be the site of the 5th annual Tucson Hamfest, sponsored by the Old Pueblo Radio Club, ARRL and ARCA. Open from 7 AM-1 PM. There will be meetings for ARCA, Repeater Owners, and AZ Node Operators. Flea Market. Sellers $4 per space (includes FREE cup of coffee and FREE drawing ticket). Buyers $1. Talk-in on 146.22/.82, 146.28/.88, and 146.52 simplex. Contact ***A.J. Pawlowski KB7K2, 3418 W. Green Trees Dr., Tucson AZ 85741. Tel. (602) 742-2605.***

OCT 24

GRANDVIEW, MO The annual Octoberfest, sponsored by the Southside ARC, will be held at Grandview East Junior High School, 12650 Manchester, from 8 AM-3 PM. Free parking. Wheelchair accessible. Advance tickets 4/$5; 3/$5 or $3 each at the door. Table space $12 per table, limit 3 per exhibitor. Set-up at 6:30 AM. Talk-in on 147.12+. A transmitter hunt will follow the hamfest. Contact ***Southside ARC, P.O. Box 1142, Grandview MO 64030,*** or ***Frank Staudenraus NØGXO, (816) 331-7338.***

GREENWOOD, N.S., CANADA The Greenwood ARC will hold its 4th annual Ham/Electronics Flea Market from 9 AM-2 PM at the Greenwood Community Center in Greenwood, Nova Scotia. Talk-in on 147.240+ VE1WN rptr. Contact ***Jim Baskey VE1APV, Greenwood ARC, P.O. Box 63, Greenwood NS B0P 1N0, Canada. Tel. (902) 765-6272,*** or ***FAX (902) 765-5449.***

SUMTER, SC The Sumter ARC will hold their 6th annual Hamfest at the Sumter Exhibition Center, 700 W. Liberty St., from 8 AM-4 PM. VE Exams. CW Contest. Friday night Cookout. Admission $5. Tables $6. Talk-in on 147.015. Contact ***Dan Mask WB5SGH, (803) 775-9106,*** or write to ***P.O. Box 193, Sumter SC 29151.***

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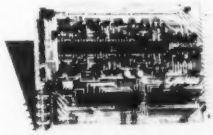

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OCT 24-25

CHATTANOOGA, TN Hamfest Chattanooga will hold their Amateur Radio & Computer Convention at the Chattanooga-Hamilton County Convention & Trade Center. For more info, contact ***Barbarra Gregory WA4RMC, P.O. Box 3377, Chattanooga TN 37404. Tel. (615) 892-8889.***

OCT 25

DUBLIN, PA The R.F. Hill ARC will hold their annual Hamfest at the Dublin Firehouse, Rte 313, 5 miles from Doylestown. VE Exams, all classes; bring documents. Flea Market spaces: indoors $8; outdoors $6. Bring your own tables. Admission $5. Hamfest Hotline: ***Bob Frantz, (215) 536-9098*** or ***P.O. Box 29, Colmar PA 18915.***

MILFORD, CT The Coastline Amateur ARA will conduct VE Exams for all classes at the Fowler Bldg., 145 Bridgeport Ave., starting at 12 noon. Walk-ins. Contact ***Gary NB1M, (203) 933-5125*** or ***Dick WA1YQE, (203) 874-1014.***

OCT 31

FRANKLIN, KY FranklinFest '92 will be sponsored by the Southern Kentucky AR Group, on Wall St., from 8 AM-2 PM. Directions: from the North—exit 6 off of I-65, Weston KY 100, turn left onto KY 1008 to Wall St. Event is on the right side of the intersection. From the South—Exit 2 off of I-65, north on US 31W, right on 1008, left on Wall St., we're on the right. Nashville is only 40 minutes away. Admission $5 in advance. Tables $4. Free parking for cars, RVs and busses. Talk-in on 146.065/.665 and 146.52. Contact ***Ed Schwab KA4REF, P.O. Box 9656, Bowling Green KY 42102. Tel. (502) 843-4389.***

GROTON, CT The annual Tri-City ARC Auction will be held at the Senior Citizens Center, Waterford Municipal Complex (Rt. 85, south of Exit 77 of I-395, or north of Exit 82 of I-95). Set-up at 9 AM. Auction from 10 AM until sold out. Free admission. Wheel chair access. Bring your equipment to be auctioned. Talk-in on 146.07/.67 rptr. For info call ***KA1BB, (203) 739-8016.***

ST. LOUIS, MO The Gateway Ham Radio Club will sponsor a Hamfest at the West County Technical School from 8:30 AM-2 PM. Set-up at 6:30 AM. Exit south from I64/US40 on Maryville Center Drive. VE Exams: call ***(314) 567-8777*** to register. Flea Market. Admission tickets $1 in advance, $2 at the door. Indoor tables $5. Tailgating $3. Talk-in on 146.94/4. Contact ***Angie Fischer KBØHXY, (314) 225-5560***, or ***Dave Novak NØDN, 10 Ann Ave., Valley Park MO 63088. Tel. (314) 225-1952***, answering machine.

ST. PAUL, MN The 8th annual Hamfest Minnesota & Computer Expo will be held at the St. Paul Civic Center. Presented by the Twin Cities FM Club, "The Big One" will feature major manufacturers, a huge indoor Flea Market, VE Exams, etc. Advance tickets $5, $6 at the door. Tables $18 ea. Special educational seminar by Carole Perry WB2MPG. Talk-in on 146.16/.76 rptr. For info, write ***Hamfest Minnesota & Computer Expo!, P.O. Box 5598, Hopkins MN 55343***, or call the ***Minnesota Hotline, (612) 535-0637.***

NOV 8

LONG ISLAND, NY HAMEXPO, sponsored by the Radio Central ARC, will be held from 9 AM-4PM at Suffolk Community College, Long Island Expwy exit 62—Nicholls Rd./County Rd. 97 North 1 mile. Free parking. All indoor Flea Market, ham dealers, computer show, VE Exams, DX. Admission $5 at the door. Tables $20 in advance. Send to ***Radio Central ARC, P.O. Box 680, Miller Place NY 11764.*** Talk-in on 145.15-4Z or 449.525-2A. Contact ***John Mark KB2QQ, (516) 689-6336*** or ***Jo Ann Colletti N2IME, (516) 399-1877.***

SPECIAL EVENT STATIONS

OCTOBER 1992

BAHAMAS The Bahamas ARS will operate C6A500 throughout the month of October, to commemorate the 500th anniversary of the discovery of the New World by Christopher Columbus. Operation will be continuous during 0001Z-2359Z Oct. 12, otherwise, intermittent coverage will be kept through the month. Frequencies: 3590, 3740, 7030, 7090, 7290, 14,070, 14,135, 14,290, 18,150, 21,140, 21,204, 21,390, 24,950, 28,190, 28,350, 28,990, 146.640 -600. All authorized BARS members may operate in Oct. with /500 suffix. Awards: 1. Three different /500 contacts; 2. Ten different /500 contacts (one must be C6A500). For QSL send SAE and 3 IRCs to ***BARS, Box SS.6004, Nassau, Bahamas, or Bahamas Bureau.*** For an award, send a copy of your log with 3 IRCs.

OCT 1

HOUSTON, TX The M.D. Anderson Hospital AR Volunteers, sponsored by the University of Texas M.D. Anderson Cancer Center, will operate Station KK5W, 1500Z-2100Z, to commemorate the 9th annual Childrens' Christmas Card Parade through the Medical Center. During 1630Z-1830Z, operation will be from a float in the parade. Frequencies: 7,292.9, 18,129.9, 21,392.9, 28,392.9. For a certificate, send QSL and a 9 x 12 SASE to ***KK5W, M.D. Anderson Hospital, Amateur Radio Volunteers, 1515 Holcombe Blvd., Houston TX 77030-4095.***

OCT 3-4

PITTSBURGH, PA The Breezeshooters ARC will operate W3XX from the USS Requin SS481, a WWII submarine. Time: 1400Z-2100Z each day. Phone frequencies: 28.450, 21.350, 14.250, 7.250, 146.52. CW frequencies: 28.150, 21.050, 14.050, 7.050. This SE Station is being operated to celebrate the 1st year anniversary of the Carnegie Science Center. For a QSL card and certificate, send an 8 1/2 x 11 SASE to ***Ron Berry WB3LHD, 326 Sunset Dr., Bethel Park PA 15102.***

OCT 10-11

COLOMBUS, IL The Western Illinois ARC will operate Station W9AWE in celebration of the Quincentennary of the European Discovery of America. Time: 1400Z Oct. 10-2400Z Oct. 11. General SSB and CW sub-bands, packet, and 147.03 W9AWE rptr. For certificate, send QSL and SASE to ***WIARC, P.O. Box 3132, Quincy IL 62305.***

NEWCASTLE, IN The Henry County ARC will operate Station KA9RWP in conjunction with the "Raintree Jamboree," beginning at 10 AM both days, on the General portion of 80m, 40m, 20m, and 21.385/28.385. Contact ***KA9RWP, P.O. Box 607, New Castle IN 47362.***

TULSA, OK Tulsa ARC, under the call sign W5OK, will be the official SE Station for the "Year of the Indian 1992" being celebrated throughout the State of Oklahoma. The Office of State Tourism has recognized the TARC for this celebration. The event will begin at 1700Z Oct. 10 and will end 1700Z Oct. 11. Phone—lower 25 kHz of the General 15, 20, 40, and 80 meter sub-bands and the Novice 10 meter sub-band. There will also be a 2 meter SSB station. CW—lower 25 kHz or the General 20, 40 and 80 meter sub-bands and the Novice 15 meter sub-band. For a unique certificate, send QSL and a 9 x 12 SASE to ***Tulsa Amateur Radio club, P.O. Box 4283, Tulsa OK 74159.***

OCT 11-12

COLUMBUS, OH The Columbus ARA will operate W8TO 11 AM-10 PM EST (1600-0300Z) Sat., and 11 AM-8 PM EST (1600-0100Z) Sun., to commemorate Columbus Day and the 500th anniversary of the discovery of the Americas. The station will operate portable from the Columbus Day Celebration Site, Riverfront Dr., downtown Columbus, in the General and Advanced portions of 10, 15, 20, 40, and 80 meters, beginning with the 10m band and moving to the next band every two hours each day. Contact with W8TO counts 6 points per band per day. Contacts with any other central Ohio station (0500Z Fri.-0500Z Sun.) on any HF band counts 1 point per station per day. For a commemorative certificate, send a copy of the log sheet(s) which show contacts worth at least 10 points, and a 9 x 12 SASE, to ***Thomas Camm, 1634 Dundee Ct., Columbus OH 43227-2421.***

OCT 15-18

CINCINNATI, OH U.S.A. area radio amateurs will participate in the 1992 Tall Stacks Celebration of America's river steamboating era, throughout the month of Oct. On-air operation is sponsored by the Greater Cincinnati ARA and the OH-KY-IN ARS. QSL cards will feature the 17 historic steam paddle riverboats that will assemble on the Ohio River at the Port of Cincinnati from 15-18 Oct. QSLs will be available from Tall Stacks stations, for contacts throughout Oct. Participating stations will use the call sign suffixes "Tall Stacks" or "/TS." OH-KY-IN station K8SCH will be particularly active Oct. 15-18. Tall Stacks, sponsored by the Greater Cincinnati Convention and Visitors Bureau, recalls the historic and continuing importance of river commerce to middle America.

OCT 16-17

GILMER, TX East Texas area amateurs will operate KI5UA to celebrate the 55th annual East Texas Yamboree. Operation will be in the General 40, 20 and 15 meter phone sub-bands; the Novice 10 meter phone sub-band, and locally on the 147.32 rptr. For a certificate, send your QSL and 8 x 12 SASE to ***KI5UA, Rt. 2, Box 113, Diana TX 75640.***

OCT 20-21

WESTMONT, IL The Westmont ARC will sponsor a School-to-School QSO Party from 0800Z Oct. 20-0800Z Oct. 21. This event allows students of all cultures to meet one another via Ham Radio. If you want to participate, please drop a packet via ***S-KA9GQF @ W9QVE No. II. "School to School."*** Send all reports to ***Westmont ARC, P.O. Box 8, Westmont IL 60559, USA.***

OCT 21-23

NEW YORK, NY The "22 Crew" will operate WB2JKJ from the headquarters of the Radio club of Junior High School 22 to celebrate the 12th anniversary of the Club, and EDUCOM, Education thru Communication. Join them on 7.238 MHz from 1200-1330 UTC, then on to 21.395 till 2000 UTC. For an outrageous QSL and surprise package, write to ***RC of JHS 22, P.O. Box 1052, New York NY 10002***, or FAX it to ***(516) 674-9600.***

OCT 23-25

UNION, KY The Northern Kentucky ARC will operate K4CO 1400-2100Z from Big Bone Lick State Park, in conjunction with the annual Salt Festival and The Commonwealth of Kentucky's Bicentennial Celebration. Operation will be on 40, 20, 10 meter phone, and 147.375+ rptr. For a certificate, send a 4 x 9 SASE and contact number to ***NKARC, P.O. Box 1062, Covington KY 41012-1062.***

OCT 24-25

BROWNSVILLE, TX The South Texas ARA (STARS) will operate N5CAF Oct. 24-25 from 1500Z-2200Z to commemorate the Border Air Fiesta II, sponsored by the Confederate Air Force's Rio Grande Valley Wing. Voice operation on HF will be on 21330 MHz or 28425 MHz, depending on band conditions. Contacts via a UHF remote link will be attempted with CAF pilots in flying aircraft. Listen for the CAF B-17, B-25, P-51, C-47, etc. For a photo QSL, send your SASE and QSL to ***Dr. David Woolweaver K5RAV, 2210 S. 77 Sunshine Strip, Harlingen TX 78550.***

COOKEVILLE, TN The ARS of Tennessee Technological University (WA4UCE) will operate an SE Station in conjunction with the Tennessee Technological University 47th Homecoming celebration. Operations will be on the General portions of the 80, 40, 20, 15 and 10 meter bands, and the Novice portion on 10 meters. For a certificate, send QSL and a 9 x 12 SASE to ***TTARS, Tennessee Technological University, Box 5262, Cookeville TN 38505.***

OCT 31

ST. PAUL, MN Station W0AA will be operated from the St. Paul Civic Center, by the S.M.A.R.T.S. RC, in conjunction with the Hamfest Minnesota & Computer Expo. W0AA will operate on the lower 25 kHz of the 20 and 40 meter band and on the Novice and Tech portion of the 10 meter band. Time: 7:30 AM-3 PM CST. For QSL, send SASE to ***WØAA-Hamfest Minnesota & Computer Expo, P.O. Box 5598, Hopkins MN 55343.***

OCT 31-NOV 1

BREVARD, NC The Transylvania County ARC will operate K4AIF to celebrate Halloween from the Devil's Courthouse in Transylvania County. Operating hours will be from 2100Z Oct. 31-0200Z Nov. 1. Frequencies: 3.860, 7.243, 14.295, 21.365, 28.335, 144.25, all SSB and 146.52 (FM simplex). For a certificate, send a legal size or 9 x 12 SASE to ***K4AIF, Dick Gustafson, 302 Wilson Dr., Brevard NC 28712.***

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05C

Never Say Die

Continued from page 4

cover design, advertising and ad sales, dealing with printers, how to handle trade shows, make travel arrangements, write subscription, renewal and collection letters, establish ad rates, design media packs, develop direct sales, deal with newsstands and distributors, handle fulfillment of subscriptions, decide on publication size, buy paper, learn how to deal with dishonest competition and their lying circulation numbers, do cost accounting, photography, artwork, halftones, color separations, and so on. It's an endless learning experience because as soon as you get to be an expert on the subject, the technology changes.

Publishing was mostly done on sheetfed presses when I started *73* back in 1960. The type was set on Linotype machines in lead slugs. Hot type. Then came cold type and Varitypers as the printing changed to photo-offset in the 1970s. IBM jumped in front by automating their electronic typewriters and running them from a magnetic tape—I got one of the first IBM Composers and got very good at using it.

Next came Compugraphic and the Photo Typositor, with an even more advanced system. That put IBM out of the typesetting business. Then, in the late '70s and early '80s, computers made typesetters more and more intelligent. By the last of the '80s our little microcomputers were powerful enough to take over. Today most publishers are using Macintosh desktop computer systems. They set the type and even lay out the pages.

This column is being typed on my Mac PowerBook 100, a little laptop computer. The finished editorial comes out of my computer in columns, with the spelling checked, the lines justified and hyphenated. It prints out on my little desktop LaserWriter just as it will appear in the magazine. These pages are photographed and from those negatives the offset printing plates are made to print the magazine.

As a publisher I've had to learn everything about the business. I've read books, magazine articles, attended workshops, talked with other publishers and so on. Learning how to build newsstand sales is not easy. Like almost any business, the whole system is infested with sharks, all waiting to screw the hell out of you if you don't know what you're doing. I don't know if 10% or 20% of the people in any business are basically crooked or not, but the percentage is high.

These days I give lectures at colleges on what an editor does. There's much more to being the editor of a publication than correcting spelling and grammar on submitted articles. An editor has to be up to date on the technology being covered. The editor should be soliciting articles—should know the pioneers and movers in the field personally. The editor should know the key advertisers and their products. The editor has to know if a submitted article is technically correct or not. We've seen egregious examples of editorial stupidity in the audio field of late.

Heck, we saw the ARRL and *QST* get gulled into helping promote compandered sideband. The bright side of that seems to be that they may have helped suck UPS into believing that this technology would help them use the 220-222 MHz band for their communications. A few million dollars later and they've given up. Snort, chuckle. If UPS had been smart enough to take a look at where communications technology is headed instead of where it had been, they'd have opted for an all-digital system.

Even the Japanese have been blind to this, investing billions in analog high definition TV. They may have beaten the heck out of us in consumer electronics production, but they're making cataclysmic marketing mistakes which give us all sorts of opportunities—all of which we've managed to miss so far.

Just look at the way they shot themselves in the foot with their Beta vs. VHS battle, which held back the VCR market for several years. They managed to agree on CDs, so that was the fastest growing new consumer electronics industry in history. Now they're at it again with their digital compact cassette (DCC) and mini-disc (MD) technologies. These will not only damage each other, they're going to seriously set back CDs in the process.

Any business you get into in your spare time will be a learning experience which will help free you from the fear of being out of work. It's money in the bank. And, of course, once you begin to know your spare-time business it's going to expand and you'll get the heck out of that old nine-to-fiver and never have to worry again about being fired. Oh, you'll have a new bunch of worries. And you'll be working 100-hour weeks instead of 30 or so. But you'll be having the time of your life. Only your wife and kids will notice. Unless of course you entrap them in your newfound fun and they're a part of your new business.

I keep plugging for publishing because there's such a tremendous need for information. I've a list of dozens of new publications that are needed. Like there's this inventor Ovshinski out in the Midwest, who came up with Ovonics around 20 years ago. He was on to something, but he never really got anywhere because there was no publication to provide information on his Ovonic developments. You'll see his technology in Ovonic photo-electric panels, but not much else.

New technologies desperately need supporting publications. Any growing field needs information resources to feed the growth. Pick a new industry, become an expert, and start publishing. Or just start publishing and then become an expert, the way I did with computers and digital audio.

When I published the first issue of *Byte* I didn't know squat about computers. Within a year I was lecturing on 'em. Within two I'd started two more computer magazines and was putting on a major industry computer show at the Boston Commonwealth Pier. But without all I'd learned about publishing by starting *Amateur Radio Frontiers* in my spare time, none of that would have been possible.

There isn't one thing that I've done that anyone else couldn't have done. I just used my time differently. I used it to create things and to learn. I do read a lot. I just counted and I've got over 50 six-foot bookcases full of books I've read. That's about one bookcase a year for the last 50 years. That's a little more than the average person in *Who's Who* reads—they average about 20 books a year. I seem to be running more like 10 books a month, but then there are an awful lot of things I'm interested in. My recent orgy of reading as homework for my report to the New Hampshire Economic development Commission got me into a bunch of new areas.

If you're even remotely in danger of being unemployed as a result of changes in technology or business, you could do worse than look for a spare-time business to start—and use as a learning tool. We don't need management layers these days when we have faxes, answering machines, cellular phones, BBS, pagers, conferencing, voice mail, Fedex, UPS, computers and so on. Business is changing and we either change with it or we're in for a cold, hard shock as we line up for those old unemployment checks and start wondering what in heck happened.

It doesn't make any difference how well you can do a job that isn't needed anymore. Or one that can be done for half the price or less in Mexico. Or one that can be done cheaper and faster by a computer. Where are those endless rows of statisticians and people at adding machines in insurance companies? Well, they're sure not doing that kind of work anymore. So how secure is your job? If it blows away, have you a parachute ready? Have you been building other skills and interests?

Amateur radio is a wonderful spawning ground for new ideas. It provides a fantastic opportunity to learn, both from books and by doing. The early ham repeater aficionados easily went into cellular radio and two-way radio sales and service. Others just blathered and still have a problem coming up with their membership dues for the ARRL every year. Once you have some skills and know what you're doing, you'll never be short of money again. You'll be able to zip over to Europe or Asia if you want. You'll be able to go on a DXpedition to some rare spot. You'll be able to buy that new ham rig. Any new ham rig.

Mail order is coming along fast, opening up many opportunities—even in amateur radio. I started my first mail order business when I was 12 and I'm still at it with Uncle Wayne's, Music/NH, and things like that. Mail order will either teach you a lot about advertising or punish you endlessly. You'll learn about using direct mail, 800-numbers, inventory control, just-in-time deliveries, pricing, offshore manufacturing, importing, exporting, writing and designing catalogs, printing, bulk mailing, and so on. And you'll start building quite a library.

No, as an entrepreneur you won't have as much time to spend adding to the pile-ups or babbling endlessly about nothing much to people you don't know and probably won't talk with again. If the shoe fits you can get mad. I'm used to that and won't mind.

Sudden Death

There's one more benefit to building your skills. This has to do with your sense of self-worth. People who have low esteem, such as those who are retired, have a much higher incidence of fatal heart attacks. Since your sense of worth helps keep you alive, perhaps it's worth an investment of your time.

It turns out that our feeling of being useful has a lot to do with our staying alive. Well, it makes sense, from a survival of the fittest point of view. Once one is no longer useful, why not die?

A Business Opportunity

Okay, all you incipient entrepreneurs, you've been pestering me for ideas for new products. No, it isn't a ham product—not for the really big market—but you can make a ham model that ought to do well, even with the bunch of frugal (cheap) old hams we still have left making a mess of our bands.

The idea for the product came out of my research into what's gone wrong with our American educational system. Mostly it's an old socialist-oriented system, based on the factory approach to teaching. We need to admit, even in educational circles, that capitalism has won over socialism and start phasing out our failed social experiments—like our public schools.

In Japan, where families are far more involved with their children's education and far less involved with nightly family hypnotic sessions watching sitcoms and ball games on TV, complete with six-packs, the families make sure the kids understand the importance of education by providing each of their children with a desk for doing their homework.

The product then is a kid-sized desk, complete with the best lighting for doing homework. Make it sturdy, not out of cardboard. Give it places to keep things. Make it deliverable knocked-down, but simple to assemble.

With the increased parental interest in helping their kids do well in school, you should have one heck of a market for these and sell 'em by the zillions.

The ham version should be designed to fit today's miniature rigs, not the kluges of yesterday. You don't need (or even want) space for the linear—that should be kept far enough away from the operating position so that the 60 Hz magnetic field from the power transformer isn't messing with your few remaining functional brain or other cells. Our cells tend to self-destruct around strong magnetic fields.

On the ham model I'd slant the desktop to allow the face of the rig to be easily accessible—and leave room in the back for the cables. You need room for a packet unit, plus a shelf for a computer.

But the parent market is the big one. Every kid should have a well-lit, dedicated study desk and a quiet place to use it. Now, can you bring in the economy model for under $100 retail? Plus shipping, of course. The deluxe model, with drawers and shelves, should do well at around $299. And a matching comfortable chair for an extra $49?

Are You Mad Yet?

With the ARRL doing every bit as good a job of running amateur radio as Bush is Presidenting our country, our hobby, as well as our country, is in the soup. The bad guys have taken over Congress and are running the country like a Western town in the hands of the saloon owner. The administration hasn't the guts to do anything. And the closest thing we've got to a masked man to help us out is Perot. In amateur radio the bad guys have control of 20m and 75m, and a good foothold on 2. No masked man there either. And certainly no one in control. Please let me know when you're mad enough to actually do something about it!

I was just reading the FCC docket having to do with relaxing our non-commercial regulations. I got a huge laugh when I read, "The League states that its suggested amendment would not subject the service to exploitation because the self-regulating character of the service would provide the proper checks and balances." What dream world were they in when they wrote that bunch of hooey? Self-regulating? Har-de-har-har. Self-unregulated is a more apt way to put it. Obviously no one at the League has turned on a receiver in years, nor have they, from any indication I can see reflected in *QST*, been even opening their mail. We're as self-regulating as the New York City ghettos.

They did a film on the conversion, during the last two or three years, of Manchester, New Hampshire, from a relatively crime-free city, to one of crack houses and prostitutes, with the police apparently unable to stem the tide. As in many other cities where this change has taken place, the local citizens have mostly fled to the suburbs. But a few have refused to be cowed. They're fighting back. They're writing down the license plates of john's cars. They're setting up neighborhood action groups—and they're having some success.

I've been hassling the ARRL for several years now to organize a self-policing system which would help clean out the garbage on our bands. Well, obviously they aren't going to do anything, so it's up to you. We need to form some posses to go after our bad guys. And I'm not talking about just documenting their evils and turning the dossier over to the FCC for action. I'm talking about us doing the action.

We need to pinpoint the bad guys. Fine, let's start by setting up a high frequency direction finding network. From there we can get local groups to find out exactly who is trashing us. Once we know that it's time to get the posse together and visit the low life en mass. This will have an effect 90% of the time.

But suppose it doesn't, then what? Hey, you've just begun to fight. How about a little neighborhood newsletter delivered to all his neighbors, telling them what he's been doing? This will put pressure on him through his family. How hard can it be to find out where he works?

I'll tell you this, if I lived in the city and prostitutes started setting up business near me I'd be out there with my camera, snapping pictures of every car that stopped to talk with them. I'd get their home address from the city records and send a picture to their wives to let them know what their husband's doing. I might even print the pictures on postcards. Snicker.

You remember when people would take your picture walking along the street and then hand you a card telling you where you could get a copy? I wonder if the johns might want to spend $20 for a photo of them talking with a prostitute from their car? You might be able to generate a very good business that way—make several hundred dollars a day. If they don't pay the $20 their wife'll get the picture. It's my entrepreneurial twist of mind—I can't help it. Why not make a buck and do good at the same time? If they can afford $50 for the prostitute, they've got an extra $20 for you.

Anyway, there's plenty we can do to clean up our bands—but we have to want to enough to make the effort. We have to care. I think it's clear to even the most fuzzy-minded hams that the ARRL isn't going to do squat—and we know the FCC would rather just close down the bands than spend the money to police them. It'd be cheaper—and then they could auction them off and put a few billion into the treasury for Congress to send to some lousy dictator, or to build useless dams. They spent a few mil building a totally unneeded dam in Peterborough, courtesy of the political clout of Senator Cotton a few years back. Great pork project. Buncha crooks.

It's all up to you. I've explained how you can reclaim our bands from the bandits, but you've got to stop grousing and actually do something. The meek do not seem to be making much progress in inheriting the earth. They're more giving ground.

How The Brain Works

It might be closer to entitle this piece "Why we're all crazy." That's more the normal journalistic style—go for people's attention. Well, it works for the *National Enquirer*, right?

Though we tend to constantly look for similarities in people—things with which we are familiar—we have to admit that everyone is different. Some are a lot different, some just a little. Those who are a whole lot different we label as crazy. But it's all just a matter of degree.

And that raises the question, how come everyone is so different? And when someone gets too different is there anything we can do about it? Or do we have to lock 'em up and do our best not to be bothered? Of course once we understand why people are different, that'll presumably help us not only repair those who are the most screwed up (different), but might also help anyone with a less than optimum response to things.

To understand how our mind works we have to start with some very basic concepts. Also, I hope the concept that the mind and body are parts of the same organism and can't really be considered separately won't strain you. When I refer to the mind, that's shorthand for mind/brain/body.

Law One

All living things obey one universal law, the law of self-preservation. It's a good basic law and the one from which the other natural laws developed. Once you have that one law, the others are inevitable—such as survival of yourself through your children—and the survival of all living things through natural selection and the survival of the fittest.

Now, if you were going to design a living thing of any kind, you'd build in the self-preservation law as part of the most fundamental programming. You'd hard wire that into the computer system. Computer system? Well, all living things seem to be able to be aware of other living things and react to them, from amoebas to trees—even most people. That calls for some kind of intelligence that we don't see in a rock—or on 14.313 kHz. So let's, for simplicity's sake, compare whatever living things use to be aware of other things and react to them to a computer. It'll greatly simplify my job of explaining how people work. If you understand about programming computers, that won't hurt either. That means understanding about hard-wired instructions, machine language, and so on.

So let's start by comparing our brain to a computer. And that's mostly what it is. No, it isn't digital. We're just beginning to discover how the fool thing really works. We have discovered that it's awfully complicated, but we haven't even located exactly where memories are stored or in what way they're stored. We know, but don't like to admit, that not all brains are equal at birth. There's a little matter of genetic design, with everyone being a little different. That "all men are created equal" stuff is baloney and gets reason-challenged people into all kinds of trouble. Some people start out with better brains.

Alas, by the time the kid gets squeezed out into the world some nine months later, the environment has already had a good (or bad) head start on programming. Now, if you use common sense (whatever that is), or understand computers, you know that the earlier the programming, the more influence it has on the end ability of the computer to function effectively. Well, you're going to hate the concept, but that's the way it is with kids. That nine months sloshing around, getting occasional poundings from dada as he sees how close to birth he can continue sex with mommy, and other discomforts, all are programmed into the developing computer system.

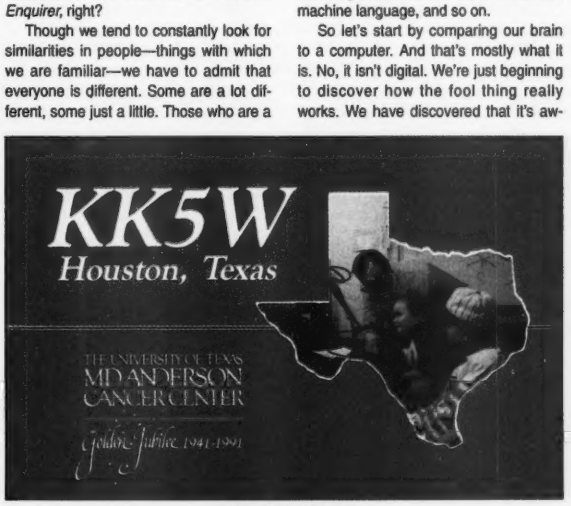
Yes, that little fetus can hear what's going on. No, it can't think yet. But it can and does react to noises, drugs, and other disturbances. The real downer is that little icky in there is busy recording a lot of that noise—and that includes voices. Ask me how come the fetus does something like that.

Let's go back to Law One, self-preservation. Well, if a living thing is going to preserve itself it has to avoid getting killed. Make sense? And what helps living things avoid death? Senses. Like for instance pain. We have a built-in pain sensing system to protect us from hurting ourselves. We go to rather great lengths to avoid pain because that's equated with non-survival on a very basic level.

Now here's where things get screwed up. The basic idea is a good one. The stove is hot and you get burned if you touch it. So you quickly learn to keep your wandering fingers off stoves. You avoid the pain—and that helps you keep 10 operating fingers—at least until you take shop and are inattentive for a moment.

The hard-wired programs in our computers have an instruction which says that when we feel pain we equate that pain to our other perceptics. This is a way to help us avoid the pain a second time. So if we see a stove or hear a kettle, or whatever, we don't have to consciously consider whether to draw back those fingers or not, we get 'em the hell out of there fast and think about it later. This doesn't happen on a conscious level, it's subconscious. Well, the difference in time between the two functions can save your life, so that's a good basic program.

The pain sets up this sort of look-up table in the subconscious mind which has a little bunch of neurons equating the perceptics registered at the time of pain. This is not a thinking operation, it's entirely automatic. Alas, as Congress has proven to us endlessly, even the best of laws tend to have bad consequences. And this basic response has some terrible consequences. The basic idea



QSL of the Month

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probably works fine for trees and amoebas, but by the time it's applied to humans it's in need of some serious updating. But changing a basic law is far more difficult than tinkering with the Constitution—like trying to pass a law preventing Congress from spending more money than we have.

The problem is that it doesn't take long before there are thousands of these memory circuits, all warning us to avoid sounds, sights, feelings, and so on. Then tens of thousands. Yes, it's possible to go into the mind and erase these fool equation circuits and when we do the person's IQ zooms upwards as more and more of the mind is available for thinking and no longer tied up with all that garbage.

The basic instruction says we're to avoid pain because pain can lead to death. Maybe you've noticed—all pain isn't physical. We suffer emotional pain too. And yes, the brain treats emotional pain exactly the same way it treats physical pain—it sets up a circuit with all the perceptics dutifully recorded that went with the pain.

Does all this make good sense? And now can you see why, with subconscious messages to avoid this and to avoid that, we are so irrational? That's the way we've been programmed. We don't know why we are uncomfortable when we hear a certain sound. We don't have a clue that a sound pattern can trigger our reactions. Sound pattern? Do I mean like the pattern of some words? Bet your bippy I do.

So let's go back to that fetus recording sounds when it registers pain. It's like a tape recording. There's no understanding of what the sound pattern means. That comes later, and still on a subconscious level, where the sounds still have no way to be translated into a consciously understood meaning. But, whooey, can they have an impact on our lives!

Hypnotism

If you know much about hypnotism you know that people can be made to do things they wouldn't normally be able to do—and then later have no recollection of doing them. You can tell a hypnotized person that when they wake up they will not be able to see a certain person in the room. And they won't.

You can tell them that when they've been brought out of the trance they'll take off their jacket when you touch your sleeve—and put it on again when you touch your throat. You wake them up and they'll be taking off their jacket and putting it back on a dozen times, each time coming up with what is to them a rational reason for it. After a while it'll finally become apparent, even to them, that something's amiss. But meanwhile they will sincerely explain their actions and believe what they are saying.

The subconscious works that way. The sorry fact is that we can't believe our own conscious minds. We're constantly lying to ourselves and others. This has a lot to do with why none of today's psychotherapy has much of an effect in changing people. We don't consciously lie, but on the subconscious level the lying is endemic as these protective pain avoidance circuits kick in and out.

The Good News

Yes, it's possible to help others to erase those darned pain avoidance memory circuits. I know how to do it and I'm very good at it. It takes a little practice—practice and a solid understanding of what you're doing. No, you can't do anything to help yourself—it's that conscious mind of yours, which will protect you until your death. The therapist has to bypass the conscious mind and work entirely with the subconscious—which fortunately is simple to do.

The Bad News

As far as I know, no one is available anywere who knows how to do this. There used to be a few people who were very good at it, but most of 'em are dead now—and I'm not looking so good myself. The other bad news aspect of this is that once you understand how to repair screwed up brains, you also have a key to use your knowledge for evil. One chap, who I knew quite well, did this and made billions.

Wow, billions! Does that get your envy working? I think that's one of my problems. I haven't any envy. I can't think of anyone in the world that I envy—or that I even remember envying. I know a bunch of multi-millionaires and even a billionaire. I wouldn't swap with any of 'em.

Yes, I can tell you how to help others with psychological problems. But you'll find the same thing I did. People's conscious minds are so protective that they'll do almost anything to avoid cleaning out the circuits that are screwing them up. They'll take off and put on their jackets for years, coming up with fresh excuses each time—excuses they really believe. And they'll get into lousy relationships, act irrationally, and make a mess of their lives and those around them. But get help? Har-de-har. It's the same with drug addicts who are the last to admit their addiction—to crack, nicotine, alcohol.

So I'm not sure why you'd want to bother learning how to help people when so few are willing to be helped. And you can't help yourself. Of course, if you work with someone else, you can help each other, which works out well. The problem with that is that you can't ever work with someone who is afraid of what you'll think. This erects a wall. It really has to be a stranger to work well. And once you get familiar with the process you can go in there and clean out whole messes of avoidance circuits in short order. You can actually help 100% of the people you work with and do in hours what other therapies only hope to do in months or years.

I've helped well over a hundred different people so far, so I have some interesting anecdotes. No, I haven't time to go back into that business, so don't ask. But I will say that very few chronic illnesses are unavoidable. Every illness has a psychological component—an easily found and erased component—once you know how.

Explaining how to repair the mind isn't as easy as explaining how it works and how it gets so screwed up, so it'll take a good deal of whining and complaining to get me back to my word processor to tackle that topic. I expect I'll get a lot more "I don't always agree with you" baloney. As soon as you've done as much research on the subject as I have I'll respect your opinions—if you can back 'em up with facts or experimental data that is repeatable—which I can. My concept of how the mind works not only makes sense, but once you understand the concept, you can see why it has to be that way. It explains everything we see happening, with no loose ends or anomalies.

Those Crowded Bands

What's all this phony-baloney about us needing more hams when our bands are so crowded that making uninterfered-with contacts is almost impossible? Sure, I get letters from readers all the time, demanding that I stop, already, with my endless push to attract more hams to our hobby. We just haven't any more room for them!

Indeed, this has been an ARRL director beef for the last 40 years. My complaining readers have apparently convinced themselves that I'm pushing for more hams so I'll have more subscribers to *73* and make more money. Well, perhaps the director mind-set explains why the League has done almost nothing to attract more youngsters, despite endless promises. Oh, oh, there goes Wayne trashing the League again! Trashing? I suppose saying the truth is considered trashing, particularly by people who don't want that truth known, or at least don't want to face it.

So let's take a look at our bands, just to get some perspective on how crowded they really are. Should I start at the high end, or the low? If I start high I'll lose your attention fast since we have so many totally unused megahertz up there, so let's begin with 160m. Here we have a 200 kHz chunk from 1800-2000 kHz. Of course I can remember from when the phone band went from 1800-2050, and every kc was packed solid with AM signals every evening. The CW band went down to 1715, but had little activity.

Loran has so chopped up the band that it's never been very popular in the last 50 years. Satellite positioning technology will eventually clean out the old Loran garbage and leave us with a clean band. I've made occasional forays down to 160m, but I've generally gotten discouraged by the noise. I'd be interested to hear from 160m denizens about how serious the QRM problems are these days—and how much the Loran noise has abated. Is QRM a major problem?

That brings us to 80m, where we have some CW traffic nets, a cluster of Novice CW, Canadian phones, and then a horrendous mess we call our 75m phone band. There's a small, hardy group of 75m DXers who haunt the lower end of the phone band, trying to sift weak DX signals through the Canadians. I used to have fun doing that, often luring European and African ops down to 75m from a 20m contact. I'll never forget the excitement when I was talking on 20m to my home station while visiting Central Australia (VK3ATN) and we went down to 75m and there was my W2NSD/1 signal, roaring in 5-9+. Wow!

75m is fairly crowded, but fortunately most of the activity is stacked up into round tables, so around 80% or so of the ops are listening at any one time. Any time you get fed up with the QRM in the phone part of the band you can plug in a computer and move down for some nice high-speed CW or RTTY round tables in the more open parts of the band.

40m. Sigh. I gave up even trying on 40m a long time ago. How about some aficionados reporting on 40m today? Where's the DX action on CW? Where are the traffic nets? RTTY? Slow-scan? Yes, I know where the phone band is—up there in that shortwave broadcasting cacophony.

Then there's the 10.100-10.150 kHz band. 50 kHz. Much QRM there? Maybe I should start a series of weekly 30m contests, with separate awards for CW, RTTY and packet? Heh.

20m. Ha! Yes, the phone band is often a mess. There are the Canadians, then the DXers, then slow-scan, then some nets, then comes the K1MAN and KV4FZ sewers. Below the Canadian phones you'll find RTTY and high-speed computerized CW and some wide open spaces where CW fans are able to work DX with very little QRM.

The 18.068-18.168 kHz band, if anyone has been able to find it, is another ITU band for CW fans. What's doing there?

15m keeps fairly busy these days, but I don't think we're going to hear much complaining about QRM.

The sun spots have been keeping 10m busy, but it's nothing like the old days. I remember back in 1946 when 10 was packed solid with AM signals whenever it was open. 28.5-29.0 was kilowatt alley. Is anybody complaining about QRM on 10 these days? I suspect we could quintuple the activity without causing too much aggravation.

Six meters was once packed with Techs between 50-52 MHz, but that was before repeaters sucked 'em all to 2m in 1970. There's not a lot doing on 6 these days.

Twenty years ago the move to repeaters on 2m was new technology. Since then we've remained technologically frozen. The rest of the world is moving to digital voice, but we're still hanging on to NFM which, by the way, I helped pioneer back in 1946. After 46 years it's almost time to start thinking of moving ahead in technology. But then we have a lot of old-timers who are still hung up in the 1930s with CW—apparently unaware that amateur radio is the only service left using this molasses mode.

As I travel around the country I check into every repeater I can reach, asking if there's anyone around. There rarely is. From what I've seen, 95% of our repeaters could be shut down and no one would really notice. Most of 'em seem to be exercises in ego extension, not communications systems with any real pur-

pose. Heck, I've got one myself which I doubt I've used once in the last six months. It serves greater Hancock, NH.

We could free up 90% of the 2m band if we stacked all of our unused or seldom-used repeaters on one channel, so don't whine to me about 2m being full. Balderdash.

Then comes our 220 band—the one the FCC sliced 40% off of for UPS, and which it now is beginning to look as if they're not going to need. Well, I warned 'em about how useless compandered sideband would be, but they had to find out for themselves, no doubt at great cost. Digital is the way to go, not SSB. We'll soon be seeing all of our FM broadcast stations going digital. I can remember when hams were the pioneers in any new technology, not the very last to change. What a comedown for us. Despite our cries of anguish over losing part of 220, the fact is we used very little of it for anything practical.

450? This is used mostly for repeater links and a few remote base stations. There's little on 450 that couldn't be moved to a higher band. Indeed, if we moved all of the repeater links to 10 GHz, we could put almost all of 'em on one single frequency with directional antennas and not have any interference between them.

We'll probably lose 900 MHz through a lack of use. And from there on up we've little going. We do some moonbounce at rare intervals on the high end of 1200 MHz. How many of you even noticed when the FCC took away 25 MHz of this band? The 2.3 and 3.3 GHz bands are empty. A few years ago Chuck Martin KO1I put together a couple simple 10 GHz transceivers—tenth-watt jobs. With these we made contacts between New Hampshire and all six New England states, plus New York. It was fun and it showed what could be done on this band with inexpensive gear. No contact was under 50 miles and one was well over 100 miles!

If we encourage new hams to start playing with our microwave bands they'll have fun and we'll have a better chance at defending our right to these bands, which would be worth billions if they decided to auction them off. We need some kits to help youngsters get started—and we need a lot of articles telling 'em how to go about it.

As a side note, Chuck and I had so much success on 10 GHz that Chuck wanted to try the same stunt on 24 GHz. Unfortunately, the parts to do this had to come from Microwave Associates and a ham there stopped the process. He was an ARRL stalwart and didn't want to see *73* get credit for the pioneering. The result was that no one has ever done it. I hope Freddie is happy with himself and his great contribution to amateur radio.

The sorry fact is that only a tiny percentage of our assigned bands are being used. 20m is packed. But then when I started in the hobby in 1936 20m was packed. Nothing has changed. 75m is packed. It was packed in 1936 too. That hasn't changed either. In those days 10m was the microwave band, with just a few daring pioneers working at getting it active. The first ham I ever visited, Harry Stevenson W1CUN, from my home town in New Hampshire, was pioneering that band back in 1935.

We have 10 times as many hams now as we did 50 years ago and, as far as I can see, 20m and 75m aren't any the worse off. As we get more hams they tend to move to the bands where crowding isn't as serious. So, even if we have 10 times the number of hams that we do today (which I think we should), 20m isn't going to get worse. As a matter of fact, a little added pressure and an influx of young experimenters might just help us develop some new modes which would allow us to sandwich in 10 to 100 times as many stations in our same bands, and probably with a lot less interference.

As we go digital, complete with compression algorithms, and probably with time division multiplex, we'll be entering a whole new world for SSBers to try and jam. 73

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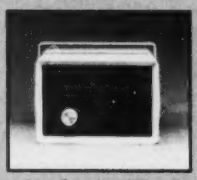

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CIRCLE 161 ON READER SERVICE CARD

Loop Antennas

Continued from page 28

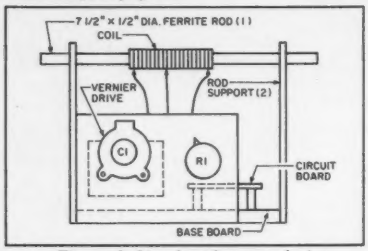

Figure 3. Simpler alternate design.

the longer the core the larger the capture area (aperture).

A friend gave me a dozen 1/4" diameter by 7-1/2" long ferrite rods with a permeability of 1800. I cemented seven of the rods together to form a core cluster 22-1/2" long. This scheme can be used with miscellaneous lengths and rod diameters. For best structural and electrical reasons, the joints in the rods should be staggered. See Figure 4.

WARNING: Ferrite rods are very brittle, like fine porcelain, and extreme care should be used in their handling. Dropping a rod is sure disaster!

I used the regenerative circuit on several of my open wire box loops, one low frequency and the other medium frequency, by adding a proper source tap. Again, the results were excellent. The source tap, for instance, on a 20-turn loop, would be at five turns.

I might mention that when the circuit is in oscillating condition, it can radiate a signal that could cause local interference (probably more so with a box type loop due to the larger aperture).

When a regenerative device such as the loop described here or a regenerative preamplifier is used with a conventional receiver it will be more effective to place the receiver in manual volume control. Turn the audio gain full up and use the RF gain control for comfortable listening. When the regenerative amplifier is in oscillating position, or near so, it can trigger the automatic gain control (or AVC) and it will deaden the receiver's response and may take several seconds to recover. This can be most annoying when you are tuning the amplifier circuit at its threshold.

In conclusion, the regenerative loop, compared with a straight preamplifier, far exceeded my expectations. While not providing the volume with the receiver using an outside longwire antenna, the loop does not have the susceptibility to local neighborhood electromagnetic interference that you would experience with a longwire, and the directional characteristics of the loop can be an important advantage.

If you like loops, try this scheme and you will be in for a big surprise.

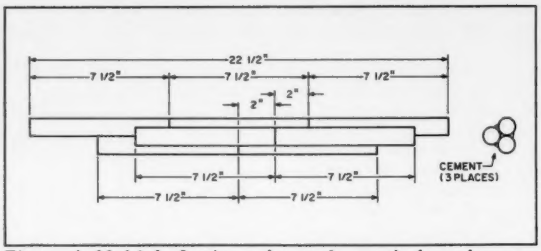

Figure 4. Multiple ferrite rods can be stacked as shown to increase the capture area (not to scale).

Parts List.

C1	365 pF variable (see text)
C2	220 pF disc ceramic
C3,C4	0.1 µF
C5	0.01 µF
R1	5k potentiometer
R2	1 MEG
R3,R4	10k
R5	1k
Q1	MPF102 FET
Q2	2N3904 NPN transistor
L1	#28 enameled wire (see text)
Misc.	Ferrite rods (3/8" to 1/2" dia., 7-8" long)

Ferrite rods can be obtained from Amidon Associates, P.O. Box 956, Torrance CA 90508. Phone: (310) 763-5770. An appropriate one for this antenna is their part number R33-050-750, a 1/2" diameter by 7.5" long rod with a permeability of 800; available for $18.

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Peterborough NH 03458

ATV Contest

The Indiana Amateur Television & UHF Club is holding their second ATV contest during the entire month of November. An ATV contest like this should help stir up activity and help inspire ATVers to improve their stations, thereby improving their DX capabilities. The object is to work as many ATV contacts as possible on frequencies of 420 MHz and above. The contest starts at 0500 UTC on November 1, 1992, and ends at 0500 UTC on December 1, 1992. Anyone in the world is welcome to submit entries.

Power Categories

To help even the odds against the Big Gun stations, there are four categories to choose from, based on your peak power level: Class I is for stations using less than 5 watts, Class II ranges from 5 to 34.9 watts, Class III from 35 to 99.9 watts and Class IV is for operators using over 100 watts.

Exchanges

Only confirmed two-way ATV contacts of 10 miles or more will count (stations operating under 5 watts have no minimum distance limit). No repeater, balloon or airborne contacts will be allowed. To enter the contest just keep a log of your contacts with the following information: 1) Callsign contacted, 2) QTH contacted, 3) Distance in statute miles (provide the latitude and longitude of the contact and your station, if possible), 4) Picture rating (P-level), 5) Power level used, 6) Time (in UTC) and date of contact, and 7) Frequency used.

Scoring and Entries

One point will be awarded for each statute mile between your station and the other station. Only one contact is allowed with the same station on one band. Contacts with the same station on different bands will be counted, however.

To enter the contest, just send your logsheet (see Figure 1 for an example) to Chuck Crist WB9IHS, 6455 Madison Avenue, Indianapolis IN 46227. All entries must be postmarked no later than December 15, 1992. All entrants should include their home phone number. Blank contest log sheets are available from WB9IHS if you send him an SASE.

The Awards

An attractive plaque is awarded to the winner in each power level category. Your name and callsign will be engraved on the plaque and you can display it proudly in the shack for one year (unless you win the next year as well). You will also receive an attractive certificate suitable for framing (see Figure 2). A separate award will be issued for the longest distance contact, regardless of power level. All awards will be issued during the January meeting of the Indianapolis ATV and UHF Club (you need not be present to win).

This contest should be a lot of fun It's a nice leisurely competition that should inspire you to dust off your equipment and warm up the frequency.

License-Free Video

I've received a number of letters asking where you can operate a TV transmitter without an FCC license. There are currently only a few frequency ranges that you can use: 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz and 24-24.25 GHz. Power levels are restricted to a very low level, measured as a field strength of 50,000 µV/meter at a distance of 3 meters (250,000 µV/meter for 24-24.25 GHz). This equates to a power level of approximately 2-10 milliwatts, depending on the efficiency of the antenna (usually a ground plane). Exceeding this field strength limit through modification of the transmitter or by using a gain antenna is strictly illegal. Harmonic content should also be down at least 40 dB from the center carrier. You can design and build up to five transmitters for your own personal use as long as you don't exceed the field strength limit; more than that number requires FCC-type acceptance or use of transmitters that are already type-accepted. The only way you can extend your range substantially is through the use of a good receive station with a gain antenna.

There are countless transmitter/receiver pairs available in mail order catalogs, local video/discount stores and Radio Shack stores that operate in the 900 MHz band. The units that I've seen use AM video modulation and are usually not crystal-controlled (some units do tend to drift somewhat). These are usually very reasonable and with modification could be the basis of an inexpensive 900 MHz ATV station (only if you have a ham license, of course).

A few years ago a number of devices showed up in the country that operated on the low UHF comercial channels (channel 14, for example). A few manufacturers offer kits that transmit in this range as well. As far as the FCC is concerned, you cannot transmit television at ANY power level on a commercial TV frequency and these devices and circuits are illegal if you use them.

If you don't have an amateur radio license, your best bet is to use the 900 MHz devices or get your license and come on over to the ham bands where you can run some *real* power! 73

Contest Log Sheet — Page ___of___ — Start Date _____ 1992

Call _____
Location _____ Class Entry _____
Optional Info: Latitude _____ Longitude _____

Date	Contact Call	QTH	Name	Distance (miles)	RPT (P1-P5)		Power (Watts)	Time (UTC)	Freq. (MHz)
					Pts.	Rcvd	Sent			
				Total =					

Figure 1. The suggested logsheet for the ATV contest.

Figure 2. Win this attractive award in the ATV contest sponsored by the Indiana Amateur Television and VHF club.

Number 24 on your Feedback card

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DEALERS: Your company name and message can contain up to 50 words for as little as $420 yearly (prepaid), or $210 for six months (prepaid). No mention of mail-order business please. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the April '92 issue must be in our hands by February 1st. Mil to 73 Amateur Radio Today, 70 Rte. 202 N, Peterborough, NH 03458

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P.C. ELECTRONICS Tom (W6ORG)
2522 Paxson Lane Arcadia CA 91007 Maryann (WB6YSS)

Number 25 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8 1/2" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS /Special Events Message Area #11. (2400 baud, 8 data bits, no parity, 1 stop bit. (603) 924-9343). Please indicate if it is for publication. Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Specifically mention that your message is for the Ham Help Column. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

Wanted: 6 meter AM gear. Also, 6m FM mobiles, 2m xtal and ICOM 21 series, VHF marine. Any reasonably priced VHF equipment considered. My wife and I are awaiting our callsigns and looking for an economical way to get on the air. *Rob Belville, P.O. Box 892, Northboro MA 01532-0892.*

HELP—I'm looking for the operating manual for the Commodore 64 computer program "Contender Plus," including the instructions for the "Country Hunter" program designed by GRUMMTRONICS in 1985 or 1986, and presently distributed by HAM-SOFT. I can copy and return, or I will pay copy costs and postage. *Ed Quinn KB2NEK, 31 George St., Avenel NJ 07001.*

I need the manual or the circuit and pictorials for the Patterson PR 15 communication receiver (early WWII vintage). I'll be happy to reimburse you. *Charles Irwin W6GAD, 61083 Sandalwood Trail, Joshua Tree CA 92252.*

DXer desperately needs a 4-NB noise blanker for DRAKE R-4C receiver. Will pay reasonable price and postage costs. Please write to: *Ali Munir AP2AL, 39 Gulberg 5, Lahore, Pakistan.*

Wanted: Owners manual for a James Millen Grid Dip Meter, model 90662-A. Advise net cost to *Otto Grube N2RSF, P.O. Box 939, Cutchogue NY 11935. Tel. (516) 734-7095.*

1 - 800 - 4 - A - HAM - TV

(ORDERS ONLY PLEASE)

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CIRCLE 17 ON READER SERVICE CARD

Arnie Johnson N1BAC
43 Old Homestead Hwy.
N. Swanzey NH 03431

Notes from FN42

1992 BARCELONA WORLD OLYMPICS A MAJOR SUCCESS Guess what I was watching as I was working on this column? The pageantry was wonderful and the sports themselves were fascinating. It is always interesting to see whether the favorites will be successful or be upset by another athlete, and whether new Olympic or world records will be set.

But, are the finishers of the first three places, the medalists, the only winners? No! It has been said time and time again by many, if not all, that everyone is a winner; just participating in the Games makes everyone a winner.

We in the amateur community can look at the Games as something that some of us do every weekend or at least several times a year. How many of us get involved in contests at some time or the other? Aren't all of us trying to win something? Aren't we trying to show how good we are? Don't we all critique our performances after completion of the contest and figure how to do it better next time and then make plans to do it?

Are we any different from those athletes? Yes, but only in our physical prowess. What do the "losers" say or do? They use what they have learned from their experience and make plans to do better next time, learning from their mistakes. We do the same thing, don't we? By always striving to become better or do a better job we further our own knowledge and maybe even technology if we think of something new that has never been done before, such as a new type of antenna or logging program.

Plus, we have fun! Don't you think that the athletes who participated in the Games also had fun? I certainly do! And I always have fun when participating in Field Day or a VHF/UHF contest, or even ham classes for new hams or upgrades.

If you think being a ham is fun, why don't you share that fun with someone in the near future? Invite some of your friends, especially nonhams, to participate in your next ham venture. And if they show some interest in becoming hams, help them to the best of your ability. Our average age has been increasing because we are not bringing "new blood" into our hobby.

If you don't know what to do, please read what Rune Wande SMØCOP has to say about the subject in the section of this column from Sweden.

***GET INVOLVED!** 73 to all from Arnie N1BAC.*

Roundup

Japan *From the JARL News:* **8J1RL Returns From the Antarctic** Mr. Toyoshi Arisawa JA4EDV, a member of the 32nd Japanese Antarctic Research Expedition Team, returned safely to Japan in March, after having stayed at Showa Base on Ongul Island since February 1991.

Mr. Arisawa, in the intervals of his regular duties (communication) as a member of the wintering party, operated 8J1RL, JARL's Antarctic station. Using HF and amateur satellite (JAS-1b), he exchanged communications with about 3,000 amateur stations in Japan as well as other countries throughout the world. In May 1991 he succeeded in making the first HF packet communication between Showa Base and Japan.

The following is the gist of Mr. Arisawa's message to all readers: "Many thanks for replying to my CQ. I imagine that other members of the wintering party at Showa Base are still calling CQ between Sunday evenings and Sunday midnight (Japan time) when they have relatively favorable conditions (mainly through 21 MHz). So please try to QSO by all means."

No More Press-To-Talk Button? No longer will it be necessary to press a button prior to talking to anyone, thanks to efforts made by Tohoku Electric Power Corporation which announced that they had succeeded, for the first time in the world, in putting "a single-frequency, two-way simultaneous communication radio equipment" into practical use. This mechanism works like a telephone because two-way communications can be made simultaneously with a single frequency.

The newly-developed radio equipment, when transforming, divides the operator's voice signals into 0.2-second segments and compresses them into half the time before transmission and allocates the other half of the time for receiving messages from the other party. Such equipment has not been put into practical use because of various difficulties, like noise caused by connecting compressed electric waves. Tohoku Electric has recently developed a new technology for the above.

It is said that this new technology can be utilized in many areas, including amateur radio.

Switzerland *From the International Telecommunication Union (ITU) Press:* **Republic of Slovenia ITU's 170th Member** The instrument of accession of the government of the Republic of Slovenia was deposited with the ITU on 16 June 1992, making the country the 170th member.

Slovenia is bordered on the north by Austria, on the northeast by Hungary, on the southeast by Croatia, and on the west by Italy. It has a land area of 20,251 square kilometers. Its capital is Ljubljana. It has a population of 1,974,839 inhabitants (1991).

Uruguay *Letter from Alberico "Bill" Lopez CX4GL:* I would like to make everyone aware of Grupo Uruguayo de Telegrafia. It is the only CW Group in Uruguay, has been in existence since 1989, and offers an award (diploma) for CW hams around the world. If you wish more information about the Award program please contact Bill at 75001 Palmitas, Soriano, Uruguay, South America.

CANARY ISLANDS SPAIN

Woodson Gannaway EA8/N5KVB
Apartado 11
35450 Sta Madre Guia (G.C.)
Islas Canarias
Spain

CONGRESO URE 92 DEL 4 AL DE OCTUBRE, LAS PALMAS DE GRAN CANARIA, SEDE SOCIAL DE LA URL. NOTAS DE INTERES: Las conferencias-coloquio estarán a cargo de especialistas en diversas materias de orden técnico y divulgativo, y están abiertas a todos los socios que deseen asistir y participar en ellas. Los contenidos de las mismas y los nombres de los conferenciantes se darán a conocer en la próxima revista.

Los coloquios a cargo de especialistas son reuniones de carácter restringido sobre materias muy concretas.

A la AGSC pueden asistir todos los socios que lo deseen, si bien solamente tienen voz y voto los miembros de la misma.

Las reservas y el abono de los billetes, se ha de estalecer directamente con: MAS, Operador Turístico, S.A., Teléfono 928-275821/31, Avada. Mesa y López, 45., 35010 Las Palmas De Gran Canaria.

[I hope that everyone understands the previous message about a ham radio conference in Las Palmas de Gran Canary from Woodson because I'm afraid that I do not speak or read Spanish. It was received by FAX and appeared to be something that needed to get into the October issue. Woodson says that there are no official provisions for translation during the conference, but foreign hams are most welcome and the local hams are always very helpful and hospitable. If you have any questions you may call the radio club (URL) at (928) 41 11 77 or FAX:(928) 41 84 25—Arnie]

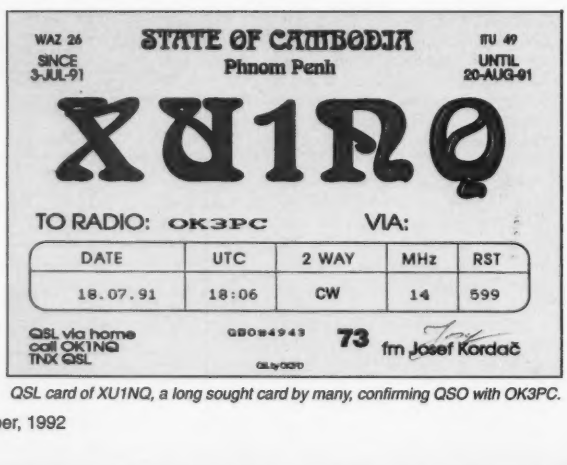
CZECHOSLOVAKIA

Rudolf Karaba OK3PC
Gogolova 1882
955 01 Topolcany
Czechoslovakia

CQ CQ CQ de XU1NQ sounded for the first time in the morning of July 3, 1991, on 21 MHz by CW. In a few minutes all the people who were listening on this band "queued up" and the hunt for this callsign began. Some stations were very carefully finding out if the callsign was right and that they weren't working a pirate. I am not surprised because this "expedition" was not reported in advance.

A few years ago I dreamed about operating from some rare countries and I had the possibility to visit them later—ZA, 3W, 5A, YI, ET, D2, and also 3W in 1991, and then XU. I was unable to receive a licence in Hanoi so the only hope was to get to Phnom Penh. I reached Phnom Penh on June 21, 1991, and immediately I "started the action" of getting a licence. I must thank the head of our embassy who helped me very much. It was not easy at first to be refused but in the end it was worth it. I was allowed to choose the callsign, but it could not have been used before. I was able to start operating from July 3, 1991.

I wasn't able to get much sleep because I wanted to make as many contacts as I could. I wasted much time by cooking and washing for myself, by necessary shopping, and an unsolvable problem—frequent switching off of the current for a few hours at a time each day. When this happened I disappeared from the band like a ghost. The summer is the time for rains, with at least one big storm every day with accompanying



QSL card of XU1NQ, a long sought card by many, confirming QSO with OK3PC.

QRN. Unfortunately, I had to sleep also.

I tried to be on the bands as often as possible. I was allowed to operate on 14, 21, and 28 MHz by CW only. The bands were mostly free in the morning. It was very interesting that the best conditions for Europe were in the evening and night, 1600-2100 UTC.

I gave priority to OK stations so I tried to get all of them on all three bands. I was hoping for at least 500 but only contacted 380 OK stations. There were great pile-ups, so QRP stations had to be patient.

The days passed so quickly and it finally came time to leave. I had made approximately 14,000 QSOs in 126 countries DXCC. I used a borrowed Kenwood TS-940AT into a log-periodic antenna directed to Europe. After four months away from OK I was looking forward to getting home, but at the same time I was sorry that XU1NQ would go QRT, maybe forever. My last QSO was with 3XØNHU on 21 MHz on August 20. The next day I departed for home through Moscow to Prague, where cases of QSL cards sent directly to my home were waiting for me. All of the logs that were written by hand while operating were transcribed into the computer and the QSL process was reversed. As many as 90% of the stations said that XU1NQ was a "new one" for them. It finally sunk in—I was a new country for many of them; it was very rare! From this point of view I can honestly say that "the expedition" was a success.

Many thanks to all for the QSOs, and to those I couldn't hear I am sorry, but I did the best that I could. 73 to all and I look forward to contacting many of you with my home call, OK1NQ. Josef Kordac XU1NQ/OK1NQ.

REPUBLIC OF KOREA

Byong-Joo Cho HL5AP
Room 401 CQ Building
157-7, Kwangan 2 Dong, Nam-Ku
Pusan 608-102
Republic of Korea

Hello to all. According to the official *Journal of the Korean Amateur Radio League*, a reciprocal license agreement has been made between the Japanese Foreign Minister and the Ambassador of Korea to Japan as of May 15, 1992. Further information will be provided as it becomes available.

Korean operators have been restricted from operating portable in the past, but as of August 1st we will be able to operate in automobiles and with handhelds with power limited to 50 watts maximum. The *KARL News* said that more information will be provided in the future.

We have also heard that OK1DTG operated from P5-land on 7 MHz CW on April 17, 1992, but we have been unable to confirm legal station license information. *[Reported in the August issue of 73 in this column in a letter from Josef Zabavik OK1DTG/P5.—Arnie]*

Now for some personal news. I had hoped to operate from D73DX, special DX contest call of the KARL during the 1992 WW WPX Contest from Pusan Yachting Harbour, but I operated with my own callsign at my home. For those of you who contacted D73DX, you may QSL via HL5BUV, P.O. Box 12, Pusan 600-600, Korea; or via HL5BPF (*1992 Callbook* ok); or via the Bureau. They have printed up a special QSL card for this year's contest.

Best wishes to all from Korea.

SWEDEN

Rune Wande SMØCOP
Frejavagen 10
S-155 34 Nykvarn
Sweden

NEW NOVICE LICENSE Foreningen Sveriges Sandareamatorer, SSA, and the Swedish Telecommunication Authority, Telestyrelsen, have together worked on a program for recruiting new radio amateurs. The annual growth of the ham population in Sweden has been lower each year during the 1980s and the net growth has been close to zero for the last two years. The average age for the ham population has increased each year. It is difficult to attract young people to become hams. The lowest age limit for a ham license has been 14 years, which seems much too high. By that age, young people have tried a lot of hobbies and it is then very difficult to get them to try ham radio. Furthermore, they have to do a lot of studying and learning Morse code before they are allowed to start transmitting. Young people, although they learn quickly if they want to, do not always have that patience.

What should we do about this? The traditional activities we have done so far have been positive but not enough. We must catch the youngsters in the schools and already in the lower grades. We must get the teachers interested in bringing ham radio into the schools. With this goal in mind, SSA, the Swedish national amateur radio organization, said to Telestyrelsen that "we need a supporting contribution from you." The amateur radio section of Telestyrelsen has also been worried about the NIL growth and are very supportive. The result from the discussions on this subject came in June 1992.

A new license, the Novice license, has been implemented. The lowest age limit for this is 10 years, or, in fact, you can become a licensed ham "during the calendar year you turn 10 years of age." This gives us a totally new group of young people for our approach. This Novice license is a no-code license, gives privileges for two bands, 144 and 432 MHz, all modes. The maximum power limit is 25 watts PEP output and 100 watts ERP. The requirements for the license exam is more towards operating practice than theoretical technical aspects. The fee for the Novice exam is lower than for other classes of license and if you upgrade before 15 years of age you pay a lower than regular fee for the upgrade. This is another contribution from Telestyrelsen in order to make the amateur radio license more attractive for young students.

Each licensee under 14 years of age must have a named person responsible for coaching and further education, an "elmer." We use that concept, well-known to most hams. A Novice licensee is supposed to upgrade as soon as possible and the time limit for this license is six years and cannot be renewed. However, if you are under 14, you must have the Novice license two years before you can upgrade, which means that you can get a higher class license "the calendar year you turn 12."

Although the other classes of licenses are more or less unchanged, this Novice license is one part of the package. Before this addition, we had three classes of licenses for HF/VHF: Class A, B, and C. A fourth class, T for Technical, is a no-code VHF license. The lower age limit for A (our highest class of license) is lowered from 17 to 15 years of age, C from 14 to 12, and T from 17 to 12 years of age.

The Telecommunication Authorities in Europe are trying to "harmonize" the requirements for one major license and one no-code VHF license, a so-called CEPT Class 1 and Class 2 license. The idea is that if you move from one country to another, you do not have to pass a new exam in that country if you already have a "harmonized license" from your home country. Therefore, in Sweden, the code speed requirement for the Class A license has been lowered from 80 marks a minute (16 wpm) to the more common 60 speed (12 wpm). This change made the difference between Class A and B very little and Class B will be phased out by not issuing any new Class B licenses.

Now we are starting activities in schools and a possible success lies in our own hands. We radio amateurs must not any longer hide in our shacks in the basements. We are an aging population and we must get new blood into ham radio. SSA has produced a six-minute video with a "young touch." We are working on getting this video to be shown in all schools and there is a program for getting hold of those students showing interest in knowing more about how to become a ham. We must do this ourselves if we want amateur radio to grow and prosper. If we do not, we probably will lose privileges and frequencies to other services.

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Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the Barter 'n' Buy, Sue Colbert, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls.

Deadline for the November classifieds is September 12, 1992.

HAM RADIO REPAIR CENTER, quality workmanship. Solid state or tube, all makes and models. Also repair HF amplifiers. Affordable Electronic Repair, 710 East Thomas Rd., Scottsdale AZ 85251. (602) 945-3908. BNB220

FINALLY HEAR those unreadable signals buried in noise, heterodynes, tuner uppers. The **REVOLUTIONARY** new JPS audio filter NIR-10, digital signal processing, simple hook up, deep discounted $329.95 delivered! Authorized dealer: Davis RF Co., P.O. Box 230-S, Carlisle MA 01741. 24-HR. Orders: (800) 484-4002, code 1356. BNB254

THE MOST COMPLETE AND COMPREHENSIVE RESISTOR COLOR CODE IDENTIFICATION CHART/COIL WINDING DATA CHART/L, C, F NOMAGRAPH. Is your resister identification getting rusty? Don't waste time looking for that old basic electronics book. Have this handy chart posted above your work bench. Chart includes these hard to interpret 5-band precision resistors, includes all known tolerance colors too! Included with the resistor chart is a handy coil winding data chart for RF coil windings. For those who hate to do math calculations, if you know any two of your L, C, or F, you can find the other instantly with this handy L, C, F Nomagraph! Send $3.00 to **TMS ELECTRO DATA INC.,** 4906 S.E. Mills, Lawton OK 73501. BNB255

QRP KITS IN CANADA! CW Transceivers, Receivers, Communication Headsets, and more. Large SASE or Call: "CQ RADIO KITS," Box 1546, Bradford, Ontario. L3Z-2B8 CANADA. (416)-775-9119. BNB433

QSL CARDS- Look good with top quality printing. Choose standard designs or fully customized cards. Request free brochure, samples (stamps appreciated) from Chester QSLs, 310 Commercial, Dept. A, Emporia KS 66801. FAX (316) 342-4705. BNB434

REVOLUTIONARY HYBRID AERIAL WIRE: 168-strand copper **"FLEX-WEAVE"** Tm, #14, strong, Ultra Flexible, ties in knots, nonstretch, won't rust/kink like copper weld, $36.95 first 275' (minimum), $.13/ft. thereafter, includes shipping! (Radial wire only.) Catalog $1.00. DAVIS RF Co., P.O. Box 230-S, Carlisle MA 01741. (800) 484-4002, code 1356. BNB557

COAX, GROUND RADIAL WIRE, lowest cost, top quality, MilSpec RG-213, $.38/ft.; RG-8X, $.19; RG-58, $.18; LOW LOSS Belden equiv. RG-9913, $.39; any lengths plus shipping. Radial wire #16, $39.50/1000 ft. includes shipping! Immediate shipment. Catalog, $1.00. DAVIS RF Co., P.O. Box 230-S, Carlisle MA 01741. (800) 484-4002, code 1356. BNB562

WANTED: Six Meter Transceivers and Linear Amplifier. Am especially seeking Clegg Venus and Zeus. Must be excellent condition only. Leave message: Jim, 703-922-9789. BNB563

WANTED: ROBOT 1200C in excellent electrical condition. MUST HAVE SCOTTIE 3.6 EPROM. Call sign irrelevant (SWL use only). Simon 609-663-5362. BNB701

RIG REPAIR by 20-year ham. Fast, reasonable. Skip Withrow, 5404 S. Walden Street, Aurora CO 80015. (303) 693-0997.BNB702

IBM PC VIDEO DIGITIZER 640 BY 480 RESOLUTION. 256 gray levels, $89.98. Demo disk, $3. Information, $1. Colorburst, Box 3091, Nashua NH 03061. BNB703

ROSS' $$$$ NEW October (ONLY): KENWOOD TH-28A $330.00, TM-241A $354.90, TS-450SAT $1198.90, TS-711A $929.90, ICOM 2GAT $322.00, 229H $358.00, 735 $910.00, ALINCO EP-2010 $85.00, EBP-12NA $50.00, ALM-203T $209.99, BUTTERNUT HF6VX $140.00, RMK-II $54.50, YAESU FT-709R $289.99, FT-2400H $340.00, FT-470 $370.00. ALL LIMITED TIME OFFERS. LOOKING FOR SOMETHING NOT LISTED OR HARD TO FIND? CALL OR WRITE. Over 9,000 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. HOURS TUESDAY-FRIDAY 9:00 TO 6:00, 9:00-2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852-0830. BNB707

BIG BOOK OF MODIFICATIONS Amateur, Scanners, and Receivers. Simple to Complex electronic and keyboard modifications. Send $20.00 US to Mike Poczynek, Fiesta Mall, Box 56074, Stoney Creek, Ontario, Canada, L8G 5C9. BNB711

PACKET MASTER 1.0 Now run Packet from Windows. Multitasking software makes Packet easy! Send $19.95 to The Mercury Group, 5901 Mercury Drive, Fort Collins CO 80525. BBS 5 p.m. - 8 a.m. 303-223-7280 voice 8 a.m. - 5 p.m. BNB709

GIANT SOLAR PANELS $44.00 EA! Excellent Prices/Solar Equipment/Accessories. Free Information/Send Stamped Envelope, Catalog $3.00. To: Pak Rat Electronics, P.O. Box 690073, Houston TX 77269. (713) 893-0313. BNB715

SIMPLEX REPEATERS $149.00! We manufacture them ourselves. Pak Rat Electronics. (713) 893-0313. BNB716

ELECTRON TUBES: All types and sizes. Transmitting, receiving, microwave . . . Large inventory = same day shipping. Daily Electronics, 10914 NE 39th ST. Suite B-6, Vancouver, WA 98682. (800) 346-6667 or (206) 896-8856. BNB719

WE HAVE IT! AEA, Astron, Bencher, Butternut, Callbook, Comet, Diamond, Hustler, Kantronics, Larsen Antennas, MFJ, Radio Shack, Smiley, antennas, Valor antennas, and more. Small town service with discount prices. Dandys, 120 N. Washington, Wellington KS 67152. (316) 326-6314. BNB722

MINIATURE POLICE RADAR TRANSMITTER one mile range, $41 assembled, $31.00 kit, (219) 489-1711. P.O. Box 80096, Fort Wayne IN 46898. BNB725

BUILD YOUR OWN WIRE ANTENNAS, parts, GROUND RADIAL WIRE, open-wire feedlines, copper-weld, insulators, coax, Dacron rope, baluns, etc., LOWEST PRICES. Catalog, $1.00, DAVIS RF Co., P.O. Box 230-S, Carlisle MA 01741. (800) 484-4002, code 1356. BNB726

HAM RADIO REPAIR—Prompt service. ROBERT HALL ELECTRONICS, 1660 McKee Rd., Suite A, San Jose CA 95116. (408) 729-8200. BNB751

PICTURE QSL CARDS of your shack, etc., from your photo or black ink artwork. 500 $28.00, 1,000 $44.50. Also non-picture cards. Custom printed cards, send specifications for estimate. Send 2 Stamps for illustrated literature. Generous sample kit $2.00, half pound of samples $3.00. Raum's RD2, Orchard Road, Coopersburg PA 18036. BNB756

ALUMINUM MAST- 2" OD X .25" wall, type 6061-T6. 6' $39.95, 9' $59.95, UPS paid lower 48. Lengths to 24' in stock! Doug/WS9W, Box 384, Stoughton WI 53589. BNB757

RAMSEY AND ICOM-22S OWNERS: Conversion kits for full coverage, direct frequency entry, 5khz spacing. Send SASE for details to: TechnoLogic Concepts, 1803 Mission St., Suite 308, Santa Cruz CA 95060. BNB758

DO YOU SURVIVE? Can you contact the Spirit World with electronics? Instructions $10, Guaranteed, 18 Yrs. Experience. Bill Weisensale, Box B.Q. C6, Barstow CA 92312-3030. BNB759

AMATEUR RADIO SERVICE: Complete repair facility. 15 years communications repair experience. Special service needs? No problem. Give us a call. Compassionate rates. HAMSERV, 1720 Grand Ave., Waukegan IL 60085. (708) 336-2064 (Dean) or Voicemail at (708) 580-2034. BNB760

THERMOGRAPHED CARDS! Raised print QSLs at flat printing prices. Samples: Phone (817) 461-6443 or write: W5YI Group, Box 565101, Dallas TX 75356. BNB761

WANTED: HAM EQUIPMENT AND OTHER PROPERTY. The Radio Club of Junior High School 22 NYC, Inc., is a nonprofit organization, granted 501 (C) (3) status by the IRS, incorporated with the goal of using the theme of Ham Radio to further and enhance the education of young people nationwide. Send your radio to school, your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. Please look over whatever unwanted equipment you may have, and call us. We will pick up or arrange shipping. You will receive the tax deduction, but most important, the privilege of knowing that your gift really made a difference in the education and upbringing of a child. You are invited to check into the WB2JKJ "22 Crew" CLASSROOM NET, 7 AM EST on 7.238 MHz or on 21.395 throughout the day. We will be running a Special Event station, Oct. 21-23, celebrating our 12th year of operation. The kids operating will be just some of the children hoping for your support of EDUCOM. Write us at: The RC of JHS 22 NYC, INC., P.O. Box 1052, NEW YORK NY 10002. Round the clock HOTLINES: Voice (516) 674-4072, FAX (516) 674-9600. BNB762

ELIMINATE MULTIPLE NOISE TONES in your receiver audio output. The revolutionary new JPS notch filter, model #NF-60, Digital Signal Processing simple hook up. Unlike other Notch Filters, notches out multiple varying tones. **Deep Discounted:** $139.50 delivered continental U.S.! (Elsewhere $150.00 plus shipping.) Authorized JPS dealer: Davis RF Co., P.O. Box 230-S, Carlisle MA 01741. 24-HR orders: (800) 484-4002, code 1356. BNB763

SOLAR POWERED HAMS! The Sunswitch is a charge controller to protect your batteries from over charge. Power MOSFETs are used, no relays! Assembled tuned and tested $39.95 plus $2.50 shipping. **Sunlight Energy Systems,** 2225 Mayflower NW, Massillon OH 44647. BNB774

GET YOUR PL259 CONNECTORS TODAY! Only $.35 each sold in lots of 100. Order now!!! Call or Write Foss Warehouse, 289 Schenk Street, North Tonawanda NY 14120. (800) 488-0525. BNB810

MILITARY MONITORING ANTENNAS: broadband VHF/UHF discones, biconicals, satcom types, 30-1000mc. shipboard construction, 'N' connectors, satcom preamps, antenna multicouplers, cables, accessories. (419) 726-2249. bBNB813

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DIGITAL SWRandPOWER METER, Assemble, Kit, or Plans, with Alarm and Set Points.**FREE** information. **RUPP ELECTRONICS,**5403 Westbreeze, Fort Wayne IN 46804. 219-432-3049. BNB831

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FREE details WPT Publications 1-800-800-7588. BNB840

PRINTED CIRCUIT BOARDS-etched, drilled, tin-plated. Single sided $1.25/sq. inch. No setup charge. Send negative or artwork ($10.00 for negative). We can generate artwork from your schematic. **CHELCO ELECTRONICS,** 61 Water St. Mayville NY 147571-**800-388-8521.** BNB842

INEXPENSIVE HAM RADIO EQUIPMENT. Send postage stamp for list. Jim Brady WA4DSO, 3037 Audrey Dr., Gastonia NC 28054. BNB890

FREE Ham BBS. 904-542-3028. BNB899

AMATEUR RADIO REPAIR!! All makes & models maximum labor per unit, $80.00. TELO (Dan), 1302 S. Uplands Dr., Camano Island WA 98292. (206) 387-3558. BNB900

HEATHKIT NOSTALGIA-History in pictures and stories of and by the people involved. 124 page paperback by K8TP. Send $9.95 (plus tax in WA) to Heath Nostalgia, 4320-196th S.W., Suite B-111, Lynnwood WA 98036. BNB903

COMMUNICATIONS AT ITS BEST! AR-900 $219.00, AR-1000XC $399.00, AR-2500 $439.00, AR-3000 $969.00, Lowest prices on AOR Radios guaranteed. CB's, Scanners, Radar detectors, and more. **Free Shipping** Visa/MC/AMEX. Turbo Electronics, P.O. Box 8034, Hicksville NY 11802. Inquiries: 516-938-1946/orders 1-800-33-TURBO. BNB905

R-390-A SQUELCH MODIFICATION: small external add-on module, super sensitive, works great on AM and SSB, 15 minute installation, instructions included. $25.00. (419) 726-2249. BNB906

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QRP KITS-Most circuits taken from SPRAT-the G-QRP Club Journal. Transmitters, receivers, test gear and accessories. First class stamp for catalog. Kanga, 3521 Spring Lake Dr., Findlay OH 45840. BNB909

BATTERY PACK REBUILDING: SEND YOUR PACK / FAST SERVICE. ICOM: BP2/BP3/BP22 $18.95, BP5/BP8/BP23 $24.95. BP24/BP70 $26.95, BP7 $29.95. KENWOOD PB21 $14.95, PB21H/PB6 $19.95, PB25/26 $22.95, PB2/KNB3 $29.95. YAESU: FNB10/17 $22.95, FNB3/4/4A $34.95. UNIDEN APX650 $29.95, APX1200 $39.95; HEATH110 $26.95. "NEW PACKS": ICOM BP8(800 mAh) $39.95, (1000) $49.95, (1200) $54.95, BP83 $29.95, BP84 $42.95. YAESU: FNB2(500) $19.95, (600) $23.95, FNB10S (1000) $42.95, FNB12S(600) $46.95, FNB17(600) $31.95, FNB4SL(750) $44.95. SANTEC: 142/1200 $22.95. "UDO-IT INSERTS" ICOM: BP3/BP22 $14.95, BP5 $20.95, BP8 $19.95. KENWOOD: PB21H/24 $14.95, PB25/26 $17.95. TEMPO/S $20.95. YAESU: FNB10 $14.95, FNB4/4A $26.95. AZDEN/300 $14.95. FREE CATALOG. $4.00 Shipping/order, PA+6%, VISA-M/C +$3.00, CUNARD, R.D. 6 BOX 104, Bedford PA 15522. (814) 623-7000. BNB913

LIGHTNING BUSTER. Protect your investment before it's too late! Gas discharge arrestor, DC to 500 MHz, 500 Watts PEP, SO-239. $39.95. **ELECTROMAN,** Dept. 73, Box 24474, New Orleans LA 70184. BNB914

WANTED: BUY & SELL All types of Electron Tubes. Call toll free 1 (800) 421-9397 or 1 (612) 429-9397. C & N Electronics, Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. BNB915

USED & NEW AMATEUR RADIO, SWL AND SCANNERS. We buy, sell, consign and especially trade. All used equipment has a 30 day warranty. For list or wants call **(412) 825-9450 FOR HAMS ONLY, ROBB N3JOT.** BNB916

COMMODORE 64 HAM PROGRAMS-8 disk sides over 200 Ham programs $16.95./$.29 stamp gets unusual software catalog of Utilities, Games, Adult and British Disks. Home-Spun Software, Box 1064-BB, Estero FL 33928. BNB917

ENGRAVING-CALL PINS-Wall/Desk Clocks-Club Award 3Plaques/Trophies-Desk Holders-Pen Sets-Equipment I.D. Plates. All Prices 30-50% Off Retail. Send $2.00 for color catalog or SASE for popular hamfest items to: TR Enterprises, Box 36 B, Tyler Hill PA 18469. BNB962

AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur Radio and electronics PD software, $4.00 per disk. Send 2 stamp SASE for catalog. Specify which computer! WA4EFH, Box 1646, Orange Park FL 32067-1646. BNB965

PRINTED CURCUIT BOARDS for projects in *73, Ham Radio, QST, ARRL Handbook.* List SASE. FAR Circuits, 18N640 Field Ct., Dundee IL 60118. BNB966

COMPONENTS FOR QRP'ERS, HOMBREWERS AND HOBBYISTS. Great selection and great prices large SASE to KA7QJY, COMPONENTS, Box 3893, Logan UT 84323. 801-563-5173. BNB967

MARCONI SALAD AND TESLA TATERS! ElectroMeals Cookbook, available just in time for holiday gift giving. 125+ recipes, $12.00 plus $3 S&H. **ELECTROMAN,** Dept. 73, Box 24474, New Orleans LA 70184. BNB968

EPROM PROGRAMMER plans, kits, flier SASE. Sergeant, Box 1613, San Marcos TX 78666. BNB969

AZDEN SERVICE by former factory technician. Southern Technologies Amateur Radio, Inc., 10715 SW 190 St. #9, Miami FL 33157. (305) 238-3327. BNB979

COMMODORE 64 REPAIR Fast turn around. Southern Technologies Amateur Radio, 10715 SW 190th Street #9, Miami FL 33157. (305) 238-3327. BNB982

THE AMAZING UNIVERSAL CABLE TV AND SATELLITE DESCRAMBLER. Detailed plans, theory, parts list, instructions, and troubleshooters newsletter. 20 pages. $13.95 postpaid. OCTE-D, Box 276, Alburg VT 05440. BNB985

HOBBY/BROADCASTING/HAM/CD/SURVEILLANCE transmitters, amplifiers, cable TV, science, bugs, other great projects! For catalog, call/write (916) 534-0417. PANAX-IS, Box 130-S9, Paradise CA 95967. BNB991

CELLULAR HACKERS BIBLE- $54.45. Cellular Programmers Bible-$84.45, Cable Hackers Video-$39.95, Satellite Hackers Bible-$56.95, Scanner Hackers Bible-$34.45. TELECODE, P.O. Box 6426-RF, Yuma AZ 85366-6426. BNB993

VIDEOCIPHER/SATELLITE/SCANNER/CABLE/AMATEUR/CELLULAR. Repair Manuals, Modification Books & Software. Catalog-$3.00. **TELECODE** P.O. Box 6426-RF, Yuma AZ 85366-6426. BNB994

ROTOR PARTS ROTOR service, ROTOR accessories: Brak-D-Lays, Quik-Connects, Pre-Set mods. NEW models for sale. Free catalog. C.A.T.S., 7368 SR 105, Pemberville OH 43450. BNB996

Packet on the Mac

Continued from page 14

a BBS in Sunnyvale, California. The window name will be: AX25 - N0ARY-1, and the session in the window will be an AX.25 session.

Watching the World Go By

You can monitor all the packet activity on a channel, including the messages NET/Mac is trying to transmit, by invoking the trace command: **trace ax0 111.** A window will open, showing all transactions. If you shrink (re-size) and relocate this trace window and open another one (by connecting to your favorite BBS, for example), you can monitor all the packet activity on the channel in the trace window and see just the packets sent to you in the BBS's window.

Controlling RFI

You've all seen the warnings printed in the owners' manuals about radio and television interference. "The equipment described in this manual generates and uses radio-frequency energy . . . it may cause interference with radio . . . reception."

Personal computers have plenty of circuits in them, running square or sawtooth waves at up to multiple megahertz rates. The Macintosh is no exception. This environment is rich in harmonics and some of them are often in the 2 meter band. When a device is tested for compliance with the FCC part B limits, the test antenna is about a meter away from the unit under test. Right next to the computer the signal strength at some frequencies may be high enough to register S9 +60 on your HT. The more sensitive and less selective your radio is, and the closer the antenna to the computer, the greater the chance that there will be interference on a particular channel. When this happens, do like the manual says: move the antenna. You can also try adding ferrites or bypass capacitors to the data and audio I/O lines.

Unfortunately, portable computing generally means poor grounding, so the effectiveness of grounds and shields may also be reduced. On a base station, you should get very good results as long as you follow the normal precautions.

Now you Mac owners can get on packet just as easily and inexpensively as those "other" computer users. 73

Parts List

All parts, with the exception of the TCM3105 and the crystal should be readily available at your local electronics emporium.

Capacitors

C1,C3	10 µF 10V electrolytic (2/4)
C2,C4,C7 C8,C10	0.1 µF mono radial (5)
C9	270 pF mono axial (1)
C5,C6	18 pF mono radial (2)

Resistors

R1-R3	50k ohm trim pot (3)
R8	23k ohm 1/4 watt (4)
R9	4.7k ohm 1/4 watt (1)
R5	75 ohm 1/4 watt (2)

Transistors/ICs

D3	LM385-Z2.5 (2)
Q1-Q3	2N2222 (3)
Y1	4.4336 MHz xtal (1) Midland-Ross MPC 18 (use 27 pF) CTS Knights R 1335-5BA4433619 (use 27 pF) Erie L 01-0096-004433618 (use 50 pF) Seiko no p.n. available (use 15 pF)
U1	TCM 3105 IC (1)
D1,D2, D4-D8	1N914 diode (6) 16-pin DIP socket (1)

(Note: A 4.4340 MHz crystal and 18 pF caps have been used successfully.)

A complete kit of parts including the PC board is available for $30 from the author at Sigma Design Associates, Attn: Dexter Francis, 22150 Berkeley Court, Los Altos CA 94024.

An etched and drilled PC board is available for $3.50 + $1.50 shipping per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

To obtain a disk containing SoftKiss and NET/Mac, including the Hypercard stack, you can send a blank 3.5" diskette along with an SASE to the author. The author can also be reached at CompuServe: 70611,1340 or Internet at Francis4@Apple.com.

Uncle Wayne's Bookshelf

REFERENCE

20N101 **Everyday Electronics Data Book** *by Mike Tooley BA.* Information is presented in the form of a basic electronic recipe book with numerous examples showing how theory can be put into practice using a range of commonly available 'industry standard' components and devices. 256 pp. 134 line drawings. **$18.00**

20N102 **Practical Digital Electronics Handbook** *by Mike Tooley* contains nine digital test gear projects, CMOS, and TTL pinouts and tables or reference data. Introduces digital circuits, logic gates, bistables and timers, microprocessors, memory and input/output devices, before looking at the RS-232C interface and the IEEE-488 and IEEE-1000 microprocessors buses. 208 pp., 100 line drawings. **$14.50**

20N103 **Electronic Power Supply Handbook** *by Ian R. Sinclair* covers many types of supplies—batteries, simple AC supplies, switch mode supplies and inverters. All types of supplies used for electronics purposes are covered in detail, starting with cells and batteries and extending by way of rectified supplies and linear stabilizers to modern switch-mode systems, IC switch-mode regulators, DC-DC converters and inverters. 144 pp., 90 line drawings. **$16.25**

20N104 **Electronic Test Equipment Handbook** *by Steve Money* is a guide to electronic test equipment for the engineer, technician, student and home enthusiast. Provides a practical guide to widely used electronics instruments and the techniques of measuring a wide range of parameters in electronics systems. 216 pp., 123 line drawings. **$18.00**

20N105 **Digital Logic Gates and Flip-Flops** *by Ian R. Sinclair*, what they do and how to use them. Seeks to establish a firm foundation in digital electronics by treating the topics of gates and flip-flops thoroughly and from the beginning. For the user who wants to design and troubleshoot digital circuitry with considerably more understanding of principles than the constructor, and who wants to know more than a few rules of thumb about digital circuits. 204 pp., 168 line drawings. **$18.00**

9D22 **The World Ham Net Directory** *by Mike Witkowski* New—2nd edition, now over 600 net listings. This book introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

10F091 **1992 International Callbook** The new 1992 International Callbook lists 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **$29.95**

10D091 **1992 North American Callbook** The 1992 North American Callbook lists the calls, names, and address information for over 500,000 licensed radio amateurs in all countries of North America, from Panama to

Canada including Greenland, Bermuda, and the Caribbean islands plus Hawaii and U.S. possessions. **$29.95**

05H24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. Indepth study of AC/DC fundamentals, SSB, antennas, amplifiers, power supplies, and more. **$29.50** hard cover only.

12E76 **Basic Electronics** *Prepared by the Bureau of Naval Personnel.* Thoroughly revised in 1972. Covers the important aspects of applied electronics and electronics communications. 567 pp. **$10.95**

12E41 **Second Level Basic Electronics** *Prepared by the Bureau of Naval Personnel* Sequel to Basic Electronics, thorough treatment of the more advanced levels of applied electronics. Includes microwave receiving and transmitting. Hundreds of excellent diagrams. 325 pp. **$7.50**

01D45 **The Illustrated Dictionary of Electronics, 5th Ed.** *by Rufus P. Turner and Stan Gibilisco.* Featuring more than 27,000 entries, an exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables, this is by far the most comprehensive dictionary of practical electronics and computer terms available. 720 pages **$26.95**

04M54 **GGTE Morse Tutor** From beginner to Extra class in easy self-paced lessons. Code speeds from 1 to over 100 words per minute. Standard or Farnsworth mode. Adjustable tone frequency. Create your own drills, practice or actual exams. Exams conform to FCC requirements. 5 1/4 floppy for IBM PC, XT, AT, PS/2 or compatibles. **$19.50**

04M55 **Advanced Edition** **$29.95**

20N091 **Most-Often-Needed Radio Diagrams and Servicing Information, 1926-1938, Volume One** *compiled by M.N. Beitman* An invaluable reference for anyone involved in Vintage Radio restoration. Hundreds of schematics, writing diagrams and parts lists, all from the original sources. **$11.95**

20N096 **How To Read Schematics (4th Ed.)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. This book is your key to unlocking the mysteries of schematics, beginning with a general discussion of electronic diagrams. **$14.95**

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RANDOM OUTPUT

David Cassidy N1GPH

Last month, I told you a story of a radio club that was discriminating against new Technician class licensees. I requested letters from you, describing your good and bad experiences. The letters have been pouring in, so I thought I'd share some of them with you.

The overwhelming majority of letters received have been positive. I've heard from new Techs from all across the country, and with very few exceptions they are reporting that local individuals and clubs have welcomed them with open arms. It seems that the boneheads I referred to last month are the exception and not the rule. This is good news indeed.

Matt N1LTW—"As a 14-year-old no-code Technician, I was, and still am, enthusiastic about the hobby. I was impressed by the encouragement given by the VEs at the test site and by those I've met over the air. They were happy to hear a new person, but they didn't want me to stop there. As a result, a little more than four months later, I am now a Technician + Code with the general written exam under my belt. By the end of the year, I plan to be N1LTW/AA. Granted, it takes a lot of self-motivation, but the extra commendation and encouragement sure does help you reach your goals!" Matt goes on to recommend the Falmouth (Massachusetts) Amateur Radio Association as a "great club to belong to."

Don N1FDF—"There are a lot of clubs that go out of their way to welcome new licensees to their folds. One local club here even gives the first year's membership as a gift to newly licensed hams, regardless of license class."

Bill N8POV—"While there are a few rabid hams who refuse to speak with those of us who are codeless Technicians, most have welcomed us. For example, I am a control operator for one of the local repeater organizations. In addition, I'm the net control station for the Central Ohio Traffic Net, the Central Ohio Severe Weather Net and the Central Ohio ARES Net. I've been warmly welcomed at repeater club meetings, ARES events and weather net training sessions. Dozens of codeless Techs are involved in many of these same activities . . . Virtually without fail, more experienced hams have encouraged me to upgrade; but not so I'll become a "real ham"—they simply know I'll have fun working HF when I do upgrade."

Tom N3LWJ—The Antietem (Maryland) Radio Association "tries to have as many classes as possible to get new hams, code or no-code! The club encourages code training only as a means to enhance your enjoyment of radio, not to set you apart. Techs are welcomed, helped, advised, allowed to vote, hold office—in other words, what any member is entitled to do . . . On the air, if you have problems, someone always comes on to help—not to put you down."

It does my heart good to receive all of these positive responses to my inquiry. Unfortunately, I have also received a few letters like the following. I've omitted any references that might identify the writer.

"One of my first contacts on the XXXX repeater was when I asked for a signal check. The reply came back, `No-code Tech?' I answered, `Yes sir,' to which there was no response, no ID, no nothing. I then politely thanked the gentleman for his response, as it was enough to let me know that my radio worked fine.

"This world is filled with people of different colors, religions, cultures and abilities. Bigotry is alive and well and has found a new `lower-class human' to attack: the dreaded no-code Technician.

"In my area, there are two linked repeaters that are monitored 24 hours a day by the XXXX Amateur Radio Society. They provide a link between hams on the highway and the highway patrol. I do not think that the dozen or so stranded motorists and accident victims whom I have called into the highway patrol would have looked down on me merely because I do not yet know Morse code . . . So far, only a few people would not say anything. Too bad. Each of us has something to offer, even if it is only a friendly ear or voice on the way home from work."

I have also received a few letters from hams who have been licensed for many years. The writers have brought up all of the same chestnuts that weren't true a year ago and still aren't true today. Two meters has *not* become like CB. Sure, every once in awhile a nervous newcomer lets a "10-4" slip through. So what! Didn't you make a few mistakes when you were first licensed? I know I did! Terms like "handle," "destinated," and an assortment of unnecessary Q-signals are heard on repeaters every day, and they were used long before the no-code license. With a little practice and the good example of other hams, any new licensee quickly gets the hang of it.

Neither has 2 meters become a crowded cacophony. I travel all over the country, and 2 meters seems about as populated as before. Since it's hard to find a populated area without access to at least a dozen repeaters, this is not surprising. People seem to congregate on one or two repeaters, and the rest remain silent.

The only thing that has happened is that amateur radio has received a much needed shot in the arm. We have attracted several thousand new members who are turning out to be an asset to our numbers. New Techs are running nets, helping with emergency communications, and doing the hundreds of other things that hams do. There's one other thing the new Techs are doing that I hope all you buzzards who thought no-code was the end of the world will take note of. New Techs are upgrading at a phenomenal rate. Every single letter I received, and every Technician I've met in the past year, have all mentioned that they have upgraded or are studying to upgrade. They're learning new things, having fun and becoming an asset to our hobby through their work and enthusiasm. I wish I could say the same about all hams.

I was glad to discover that discrimination against Techs is not as widespread as I feared. I promise you, this is the absolute last time we will address this subject within these pages. The case is closed (maybe). 73

Number 29 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

Although October is considered one of the better months of the year for DX and good HF propagation, this year is likely to be slightly different. I expect fewer "Good" days and more "Fair" or "Fair to Poor" days this year. One reason is the rapidly declining sunspot cycle and low solar flux values, together with days of predicted upsets in the earth's magnetic field. As I write this column, solar flux values have, for the second time this year, dropped to 100 or below, and I expect to see this trend continue into the fall months.

To improve your chances of carrying on worldwide contacts, use the charts as follows: First, decide where in the world you wish to communicate and then find the band and time where conditions are likely to favor propagation to that location. Next, use the daily forecast to select the day or days with "G," that is, "Good," conditions forecast. Finally, monitor WWV at 18 minutes after any hour for the latest update in solar flux and magnetic field conditions. Remember that *high* flux values, say 150 or over, and *low* Boulder "A" and "K" indexes will represent the best conditions. "A" index values below 10 and "K" index values of 2 or below will most likely represent your best opportunities when combined with the information mentioned above. The WORST days will be the 5th and 6th, the 17th through 20th, and around the 9th and again on the 30th and 31st. Examine the chart carefully. In general, set your clock to GMT or UTC (we used to call it Greenwich Mean Time, but it's now called Universal Coordinated Time) and it's the same setting as before. Our data is given in UTC or GMT, so don't make the mistake of trying to use local time for your band-time-direction study.

In October the noise levels are lower than during the summer and you can take advantage of seasonal improvements in nearly equal hours of daylight and darkness. The "Top Band"—160 meters—will begin to exhibit excellent opportunities much earlier in the evening and continuing throughout the "wee" hours of the night and early morning. The same will be true of 80, 40 and 30 meters. The higher bands from 20 meters up will close earlier, usually shortly after sundown—with only 20 showing any real openings into the late evening, and then only on some days. Ten meters will not be particularly good with declining MUFs, but satellite operators will continue to enjoy their contacts. REMEMBER THERE ARE ALWAYS EXCEPTIONS TO THESE GENERALITIES, SO NEVER BECOME DISCOURAGED. One good day makes up for many bad ones. Good luck, happy DXing and look for us next month. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15*	20	20	20	—	—	—	—	—	—	—	15*
ARGENTINA	15	15	20	20	40	—	—	10	—	—	10	10
AUSTRALIA	10	15	20	20	—	40	20	20	—	—	—	10
CANAL ZONE	15	40*	40*	40*	40*	—	20	10	10	10	10	10
ENGLAND	20	40	40	40	—	—	20	10	10	10	15	20
HAWAII	10	15	20	20	40*	40	20	20	—	—	—	10
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	15*	20	20	20	—	—	—	—	—	—	—	15*
MEXICO	15	40*	40*	40*	40*	—	20	10	10	10	10	10
PHILIPPINES	—	—	20	20	—	—	20	15*	15*	—	—	—
PUERTO RICO	15	40*	40*	40*	40*	—	20	10	10	10	10	10
SOUTH AFRICA	40*	20	20	20	—	—	—	—	—	10	10	15
U.S.S.R.	—	40	20	20	20	—	—	10	10	15	20	20
WEST COAST	10	15	20	20	E/e	E/e	—	—	—	10	10	10

CENTRAL UNITED STATES TO:

ALASKA	10	15	20	20	20	—	—	—	—	—	—	—
ARGENTINA	15	15	20	20	20	—	—	10	—	—	10	10
AUSTRALIA	10	15	15	20	20	40*	40	20	—	—	15	10
CANAL ZONE	15	15	20	20	—	40	40	10	10	10	10	10
ENGLAND	—	—	—	—	—	—	10	10	15	15	20	20
HAWAII	15	15	20	20	40*	40*	40	20	—	—	10	10
INDIA	—	20	—	—	—	—	—	20*	15	—	—	—
JAPAN	10	15	20	20	20	—	—	—	—	—	—	—
MEXICO	15	15	20	20	—	40	40	10	10	10	10	10
PHILIPPINES	15	—	—	—	—	—	—	20	10	10	—	—
PUERTO RICO	15	15	20	20	—	40	40	10	10	10	10	10
SOUTH AFRICA	20	20	20	—	—	—	—	—	10	10	15*	15
U.S.S.R.	—	—	20	—	—	—	20	15	15	15	20	20

WESTERN UNITED STATES TO:

ALASKA	10	15*	—	20	20	20	20	20	20	20	—	15
ARGENTINA	10	15	15	20	20	20	—	—	10	—	10	10
AUSTRALIA	10	15*	15*	20*	20	20	40	—	—	—	—	10
CANAL ZONE	10	15	15	E/e	E/e	—	—	—	15*	10	10	10
ENGLAND	—	—	—	—	—	—	—	—	15	20	15	—
HAWAII	10	10	15	20	40*	40*	40	40	15	15	—	15
INDIA	—	E/e(1)	—	—	—	—	—	—	E/e(1)	15*	—	—
JAPAN	10	15*	—	20	20	20	20	20	20	20	—	15
MEXICO	10	15	15	E/e	E/e	—	—	—	15*	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	—	20*	15	15	—
PUERTO RICO	10	15	15	E/e	E/e	—	—	—	15*	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	15
U.S.S.R.	—	—	—	20	20	—	—	—	15	15	20	20
EAST COAST	10	15	20	20	E/e	E/e	—	—	—	10	10	10

* Try next higher band (1) Difficult path

October 1992

SUN	MON	TUE	WED	THU	FRI	SAT
				1 F	2 F-G	3 G
4 G-F	5 F-P	6 P	7 P-F	8 F-G	9 F-P	10 P
11 P	12 P-F	13 F-G	14 G-F	15 F	16 F-P	17 P
18 P	19 P	20 P-F	21 F	22 F-G	23 G	24 G-F
25 F	26 F-G	27 G	28 G-F	29 F-P	30 F-P	31 P

FT-990
All-Mode HF Transceiver

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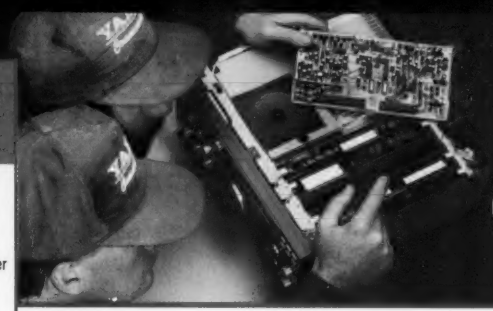
- Built-in High Speed Antenna Tuner w/39 Memories
- RF FSP (RF Frequency-Shifted Speech Processor)
- Dual VFOs with Direct Digital Synthesis (DDS)
- 90 Memories which store Frequency Mode and Bandwidth
- Full and Semi Break-in CW Operation
- Band Stacking VFO System
- Multi-mode Selection on Packet/ RTTY; Easy interface to TNCs
- Adjustable RF Power
- Variable Threshold Noise Blanker
- Optional Digital Voice Recorder (DVS-2)
- Front Panel RX Antenna Selection
- **Accessories:**

FT-990DC	Available without power supply
XF-10.9M	2nd IF SSB Narrow 2.0 kHz Filter
XF-445K	2nd IF CW Narrow 250 Hz Filter
TCXO-2	High Stability TCXO
SP-6	External Desk-top Speaker
MD-1C8	Desk Microphone
DVS-2	Digital Voice Recorder Unit
YH-77ST	Lightweight Headphones
LL-5	Phone Patch Unit for SP-6 Speaker



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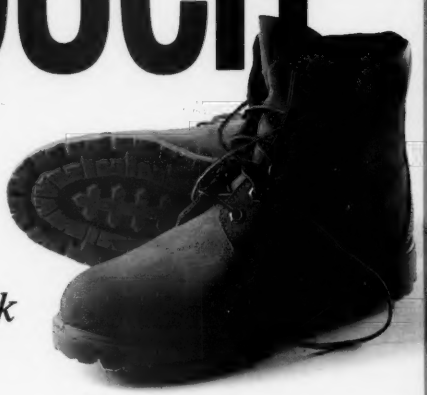
SUPER TOUCH



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TH-28A/48A

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